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EDITORIAL NOTES.

Welsbach Prices and Relations.

THE first-fruits of the new policy of the reorganized management of the Welsbach Company are foreshadowed in the announcement published elsewhere, which is an earnest of the desire of those who have been entrusted with the duty of placing the concern on a sound commercial footing to carry out the programme of reform drafted by the Advisory Committee and adopted by the shareholders. As we have before remarked, the new direction must be given time to effect big changes. They are committed to a new policy; but the character of the business is such that to do anything revolutionary without a due consideration of all the interests concerned, and without making full preparation and giving adequate notice, would merely bring about disastrous internal confusion. No one can be more anxious than we are for the gas industry to obtain cheaper mantles at the earliest possible moment. But, at the same time, it would be unfair not to give the new Directors a little grace to accomplish the work which has devolved upon them. For instance, take the retailers and the large wholesale houses who have considerable business transactions with the Company, and who are constantly sending in fresh orders at current prices to meet future business. Would it be fair to them to make an abrupt drop in price without giving them due warning? For our part, we unhesitatingly reply that it would not. Those traders would have a very just claim on the Company for some consideration for their loss on the goods stocked; and the Company would find themselves inundated with correspondence and demands, which would put for a time a check on the efficient management of their business. Furthermore—assuming that compensation was granted—what guarantee would the Company have that some among their thousands of customers would not try to defraud them? The only way to ensure against this, would be to make an immediate individual check of thousands of different stocks; and this, of course, would be a matter of impossibility.

Therefore, when fairly considered, we think there will be general approval of the course the Company have adopted in giving a three-months' general notice to those with whom they have business relations, that on July 1 next a reduction will be made in the prices of Welsbach burners and mantles, and the terms of business revised. The three months will give the traders ample time to clear off stocks; and yet the Company will not materially suffer, as the demand by users—such as it is in the spring and summer months—is sure to proceed as usual, and the retailers must, for the sake of their own business, make provision for meeting the wants of their customers. Even if the Company do experience a little falling off in the three months, there will be nothing to regret, as they must between now and July 1 be busy preparing themselves for the rush of business which is almost sure to follow upon the reduction in prices.

The "revised policy of the Company," as the General Manager (Mr. Kenneth H. Buchanan) states in his published announcement, "has for its object relations of an increas-"ingly intimate and cordial nature with the gas and allied "trades." This pledge of the acceptance by the new Board of what we have regarded as one of the strongest and most promising points in the recommendations of the Advisory Committee's report is very satisfactory to us, after the keen support which we gave to the prudent advice of the Hon. Philip Stanhope and his colleagues. In pursuance of that policy, the Directors have also decided to close the retail branches which the old Board ran in competition with the traders for whose interests they affected so much regard and solicitude. Those branch establishments must have represented a considerable expense, for which there could not have been, we should fancy, any commensurate return. To facilitate distribution, however, to enable a quick response to be made to orders, and to effect saving in carriage, the Company intend opening wholesale depôts in Manchester, Birmingham, and Glasgow. This is also a judicious move. The announcement indicates that the new management have made a determined start on the high-road of reform. The next thing people will be inquisitive about is the extent of the contemplated reduction in prices.

Urban Councils and the Borough Funds Act.

A NOTABLE blow for freedom from vexatious parochial interference with a gas company's parliamentary proceedings has been delivered by the Court of Chancery at the instance of the Rickmansworth Gas Company. The Company, as our readers have been informed, have a Bill in hand this year; and this Bill has attracted the opposition of the Rickmansworth Urban District Council—which is nothing out of the common. One of the grounds of opposition is the proposal of the Bill to extend the limits of supply to include a neighbouring parish to Rickmansworth which happens to be in the next county; and there are other objections of the usual kind. The Company, however, complained that the Council were exceeding their powers in so opposing the measure as to charge the expenses on the rates, without having fulfilled the requirement of the Borough Funds Act by obtaining the consent of the owners and ratepayers of the district. The Attorney-General, therefore, was moved to apply for an injunction to restrain the Council from so acting contrary to the statute. The defence was that the Bill is one which ought to be opposed in the public interest, and that the Council are the sole body competent to undertake this service; and, besides, that the Council are not a "corporation" within the meaning of the decided cases. Mr. Justice Kekewich, however, held that the injunction should be granted. It is, he remarked, of vast public importance that district councils should be kept within their proper jurisdiction. The statute law and the cases cannot be disputed; and in this instance the Council admitted non-compliance with the Borough Funds Act. But it was further urged that the Bill proposed to trench on the rights of the Council, so as to evoke their common-law remedy for self-defence. This was partly true; but the action proposed to be taken by the Council went very far beyond that of a body acting in its own interests. It appeared to his Lordship that this Urban District Council had constituted itself a sort of representative of the district. This is an entirely false position. "Such a Council had no "right of supervision over public interests as a whole, and "enjoyed no act of suzerainty."

This seems to be a most notable pronouncement, which local authorities throughout the kingdom would be well advised to respectfully ponder. There is unquestionably a tendency besetting such bodies to regard themselves as identical with the communities whose local government affairs they administer. This mistake is encouraged by the slipshod journalism of the day, which deems it "smart" to publish reports of the proceedings of local authorities under the heading, as it might be in the case in point, of "Rick-"mansworth Parliament." This kind of thing is done daily throughout the land; and it is no wonder that such injudicious and erroneous ascriptions of a property which does not belong to such bodies, should come to be believed in, and sometimes acted on. How can one expect a parochial busybody to always remember his place, when an even more slightly-instructed reporter is constantly misrepresenting it? Nor is this nonsense confined to small places. On the contrary, it flourishes rankly, and does much harm in connection with local authorities who, by their magnitude, can scarcely move without wasting money on all sides.

The Borough Funds Act is much abused; and doubtless it is imperfect, and ought to be amended. But this Rickmansworth injunction serves to throw into prominence that which we venture to think is the fundamental justification of the Act. This is the existing common-law relation that underlies the connection between a district and the local governing authority called by its name. Such authority is brought into being and entrusted with powers for the discharge of multitudinous duties which individual inhabitants cannot, of course, perform. But when a question arises of an

alteration in the law affecting a district, the local authority must refer, and defer, to the owners and ratepayers, whose constitutional rights are not delegated to it. It would not harm most local authorities to bear this limitation in mind more than their attitude suggests to be their habit. The truth of this matter probably is that few modern members of local authorities are students of the British Constitution; and the very multiplicity and importance of their undoubted duties and powers obscure to their eyes their purely ministerial character. It is worse in London, where, by reason of the unwieldiness of the community, the individual right of the inhabitants in respect of the initiation of, and opposition to, Bills has perforce been transferred, under certain conditions, to the London County Council. How dangerous and unsatisfactory even this limited delegation of powers is in operation, the recent parliamentary record of the County Council amply shows. At any rate, this record indicates how questionable is the policy of entrusting to a temporary majority of an elective body—which may be swayed by all manner of influences utterly unknown to, and unfelt by, the electorate—the free power to dabble in legislation which may profoundly affect the interests of the people.

Mr. A. G. Glasgow on Cheap Gas.

THE attention of our gas engineering readers is invited to a lively communication with which we have been honoured by Mr. A. G. Glasgow, and have pleasure in publishing in another column. Mr. Glasgow is, very naturally and properly, alarmed for the reputation of carburetted water gas in face of the legislative movement in favour of lowering the illuminating power of the gas supplied by gas companies, always at a corresponding sacrifice of standard price. It so happens that the technical situation created by this new fashion of gas legislation is in course of being described and discussed in these columns, and reference to the concluding lines of another paragraph, which was in type before Mr. Glasgow's article came to hand, indicates that actually the point he is anxious to make has been marked for further treatment next week. Lest it might be thought that we are disposed to unfairly prejudice the cause so ably championed by Mr. Glasgow, we take this opportunity for stating that he and everybody else shall have the widest and fairest field it is in the power of the "JOURNAL" to provide for the setting forth of every consideration pertinent to the momentous issue. As we take it, what Mr. Glasgow has to show is that the new fashion of reducing the statutory illuminating power of gas to 14 candles, where 16 candles has been required, will not necessarily put carburetted water gas to a disadvantage in this country. That is the point. Meanwhile, we venture to suggest that Mr. Glasgow is wrong in supposing, as he begins by doing, that we have lent any support, "powerful" or otherwise, to what he calls the "heresy" of diluting coal gas to a standard of 10 or 8 candles or less. We challenge him to verify his references in this respect. For the present argument, we desire to limit the discussion to the single question of how Mr. Glasgow's interest will be affected by his having to accept, as the standard of economical gas manufacture, an unenriched coal gas such as the South Metropolitan, the Commercial, and the West Ham Gas Companies are authorized to make, which may be of 14-candle power if the Engineers can so manufacture it from the raw material at their command. Any other question can be postponed for the time being.

A Sign of the Times and How to Read it.

IF the parliamentary session of 1900 made history in sanctioning an alteration in the standard of illuminating power of the South Metropolitan Company's gas, thereby recognizing, and putting the seal of parliamentary approbation upon, the changed conditions which circumstances have brought to bear upon the main business of a London Gas Company, this present session has written the continuation of the same history in characters that he who runs may read. Once and for all, the fetish system of the statutory illuminating power of the gas supply of an English town—beginning, as is only right and proper, with the capital—which rested on the assumption of the existence of a direct connection between the legal candle power of gas and its "quality," has been disestablished, and the whole convention thrown upon the dust-heap of exploded ideas. Of course, as was remarked in this column last week, official municipal science, as represented by the London County Council, was opposed to the reform. Very probably, Government science, as represented by the Gas Referees, would have showed fight against it too, if Mr. Wason's Committee had but accommodated this body with an opportunity for doing so. It is the knowledge of such a fact as this, in connection with the gas industry, which encourages a doubt as to the reality of the new "movement" supposed to have been inaugurated at Bushey House a fortnight ago. Talk about the beauty of "enlisting science in the service of industry" rings hollow in ears bent to catch the true meaning of the evidence on statutory penal gas-testing tendered in Parliamentary Committee-rooms. It may be different for other industries. We can only speak of gas manufacture.

True, Mr. Livesey did not gain his point of getting rid of the Gas Referees at a single blow. But the attempt unavoidably suggests the question: What good thing has the sort of science represented by the Referees, and also by the scientific advisers of the London County Council, ever done for the gas industry? Have all these years of supervision by University professors tended to help the gas manufacturer by the value of one penny? Have the Referees ever attempted to adapt their methods of supervision to the need of the times? They and the official gas examinations of the Metropolitan authority have ignored everything but those photometrical determinations of illuminating power to the second place of decimals of a candle, which nobody ventured to tell a Parliamentary Committee in this Year of Grace matter a straw to the consumer. But that is not all. Two years ago, all this scientific refinement would have been dropped willingly by those responsible for it, in favour of a slipshod practice in penalty photometry, admittedly vitiated by an unknown coefficient of possible error. Why? Because it was believed that the effect would be to screw another "candle," perhaps two, out of the Gas Companies—of course, at the expense of the public. And at the very time that this "scientific" plan was hatching, the tide of real industrial need and commercial demand was rising round these official sand-castles, to sweep them all away. Their builders did not see it. One may doubt if they see it yet. They wanted that additional "candle" again this session; and if London has saved the waste of £50,000 a year, which consent to that imposition would have laid upon the South Metropolitan and Commercial Companies' districts alone, who is to be thanked for it? "Science," or industry and common sense?

One broad truth shines out from the welter of words that poured over and round about this question of the quality of lighting gas during the proceedings before Mr. Wason's Committee; and it was given to a lawyer—Mr. Balfour Browne—to state it simply, in terms easy of remembrance. It was this: That the illuminating power of gas is a question of the burner. This is something that has not been admitted by official photometrists, who, if they knew it, can hardly have met without falling into the weakness ascribed to the Roman augurs. What has all the pother been about? What did Dr. Clowes mean when he accused the South Metropolitan Gas Company of having slipped through Parliament—while the County Council were not looking—a rule for gas testing which enables them to pass off what he calls 13-candle gas for what the law calls 14-candle gas? It simply means that you can make your gas-burner show anything you like, in respect of the illuminating power of the gas it burns, within considerable limits, according as you use it. This observation holds good, be it observed, for luminous-flame burners in the first place, as well as for incandescent gas lighting, which is increasing so rapidly. It is a ridiculous proposition, that a Gas Company trying to satisfy their customers with a "gas-of-all-work" should be haled before a Magistrate and fined, just because a gentleman whose ideas are confined to laboratory operations prefers to test this gas in a particular burner not demonstrably the best of its kind, and not used in a proper manner. If by these devices the gas can be shown to be by a minute fraction below the prescribed standard, the manufacturers are to be penalized, although the gas is never used in this way except for testing; and those who buy it for lighting can, and do, get seven or eight times the amount of illuminating power out of it, by merely using a different kind of burner! In other words, candle power is just as Mr. Balfour Browne said, and therefore is not worth a moment's consideration, as a definition.

Only, this solid ground of fact must be discerned, underlying these discussions: What the British gas industry needs for its continued existence, and the British public of gas consumers require for their manifold purposes, is

a sound fuel gas of about the physical characters of that to which they have become habituated. Nobody else cares a button what the Referees call it; but the business of gas supply is based upon the unrestricted supply, at the lowest possible charge, and with the utmost reliability, of gas which does not greatly differ in fuel value, or flame temperature, from that which has hitherto been sold as 16-candle gas, and is now recognized as being good enough if it is 14-candle gas. We quite agree with those who say that, until the British public become converted in greater numbers to the use of the incandescent burner, 14-candle gas is about the right article to sell for all practical purposes. This is because it happens also to be the quality of gas which can be depended upon as a regular product of the carbonization of the cheapest and most abundant gas coal at present mined in the United Kingdom, without enrichment. It is the artificial cockering-up of common coal gas, at a ridiculous expenditure of money which is utterly thrown away, in order to meet the requirements of statutory photometry, to which the British gas industry righteously objects. And so long as official "science" is identified with the hankering after this uneconomical superstition, so long will industry and commerce decline to submit to its pedantic pronouncements. It is quite likely that in some respects British science may be able to help British industry, as the great people at the Bushey House inauguration said it should do. But it ought not to be forgotten that, in order for this to be done, the science (or the scientific persons) will first have to learn as much from the manufacturers and the traders as it, or they, can hope to teach. The University professor knows something; but he does not know everything. The trouble is that he is apt to think that what he does not know is not knowledge.

This 14-candle gas will usually be coal gas; but not necessarily nor imperatively so; and here the opening for uncertainty begins. Suppose it is carburetted water gas, what is the difference? This is a question far too important to discuss at the close of an article already sufficiently long. It must be left over for a future occasion. Meanwhile, those of our gas engineering readers who are able to make the comparison between such 14-candle gases as might satisfy the South Metropolitan, Commercial, and West Ham standards, might look to it.

Use of Oil in Illuminating Gas Manufacture.

THE second of the series of Professor Vivian B. Lewes's lectures at the Petroleum Institute, on "Mineral Oil as an "Illuminant," is given practically in full in our "Technical "Record." These lectures are being delivered in that characteristic style of the Professor which has become so well known and admired in the gas industry. Being extemporaneous, and the version we give being a reported one, the sequence of thought and detail in the long story he had to tell in a short time may not be so closely knitted, or so finely constructed, as it would be in a set composition direct from the pen of the lecturer. But just as it is a pleasure to sit and listen to his oral utterances, through which runs a light vein which makes the heaviest of subjects entertaining, so it is a pleasure to read an account of his words as they fell from his lips. Therefore we make no excuse for devoting a few columns this week to the report of the lecture, in which he treats of the manufacture of water gas from its earliest introduction to its present carburetted stage, and also of the use of oil for enriching gas and for preparing that hitherto fickle illuminant known as air gas. In reading this lecture, it must be remembered that it was being addressed to gentlemen who are concerned in the fortunes of the oil industry, and who cannot therefore be expected to know much about processes which are the property of another industry. It is for this very reason that we have reported it so fully, because, limiting himself to their want of practical knowledge of these systems, the lecturer gave his audience, with a brightness, conciseness, and yet expansiveness of range which has never been equalled on this particular subject in the records of the gas industry, an account of the history and results of work accomplished in the application of oil to the production and enrichment of gas. This being so, the lecture will be useful to those gas managers who are as yet inexperienced in these branches of gas manufacture, while those who are will not fail to extract from it many little instructive and memory-refreshing points.

Professor Lewes went briskly over some of the old ground, in order to show his audience just where and when the oil industry entered into wedlock with the gas industry; how the latter by the system of carburetted water gas relieved the former of what was practically before one of their waste substances; and how the oil industry had the power of saying whether or not they are going to make it worth while for the gas industry to enter into larger and closer relations with them. It cannot be said that any very great consideration has hitherto been shown by the oil industry to gas manufacturers; and the result has been an almost complete pause in the erection of types of gas plant in the utilization of which oil is required. The oil dealers are the greatest losers; and the pause should be a warning to them. It simply proves that the gas industry, having more than one string to its bow, is not now absolutely dependent on their commodity. Certainly the outlook is brighter to-day; and there may be a return by gas manufacturers to greater activity in the erection of this class of plant.

In dealing with carburetted water gas, Professor Lewes laid the bogey of carbon monoxide. Occasional analyses of the ordinary London gas supply north of the Thames, in the composition of which there is about 25 per cent. of carburetted water gas, have never disclosed to him a larger percentage of carbon monoxide than 7, except during times of pressure in the demand, when he has found, but has never exceeded, 12 per cent. This 12 per cent. is about 4 per cent. below the quantity of carbon monoxide that Professor Lewes thinks permissible in a mixed water-gas and coal-gas supply. What he has to say on this point is worth the attention of all gas suppliers, as are also his comparisons of the various methods of using oil either for the production or enrichment of illuminating gas. It will be noted—as this is a matter that is engaging attention again now that the price of oil is cheaper and coke is plentiful—that the Professor puts the cost of 16-candle power carburetted water gas in the holder at a little over 12d., and of 22-candle power gas at slightly under 14d. The lecture carries throughout, and more particularly in its latter part, a good deal of instructive matter which the reader will no doubt prefer to pick out and digest on his own account.

Shop Clubs.

THE Shop Clubs Bill, introduced into Parliament by Major Evans Gordon, and accorded a second reading by the House of Commons on Wednesday last, is not one to which any reasonable employer will take serious objection. The Bill is based on the recommendations of the Home Office Committee who reported upon the subject in 1899, which recommendations were designed to prevent employers from making it a condition of employment that their men should join the "Shop Club" (or, as more generally termed among gas people, a Works Benefit Society), unless such club is registered under the Friendly Societies Acts, and is certified by the Registrar to be such a club as should be exempt from the provisions of the Act, is of a permanent character, affords the workmen benefits of a substantial kind at the cost of the employer, and does not require a member to resign upon leaving the service of the employer. The Committee also recommended, and the Bill before the House provides, that it shall not be lawful for any employer to make it a condition of employment that any of his workmen shall discontinue his membership of any Friendly Society to which he already belongs, or shall not become a member of any other Friendly Society.

Employers, as we have said, will not take strong exception to such a measure, so long as the clauses are found to be carefully worded, and do not, when finally passed, constitute any greater restriction upon the growth of Works Benefit Societies than the promoters of the measure desire—a not impossible contingency, in view of the bitter hostility to those Societies displayed by Trade Union leaders and the Labour Members of Parliament. These gentlemen profess to see in the compulsory Shop Club an instrument for unjustly binding the man to his master, and talk loudly about the infringement of the liberty of the subject involved in such compulsory membership. And they are the very gentlemen who approve of the men in any particular shop or works making it a condition of employment there that every man shall belong to the Trade Union, shall do the Trade Union quantity of work, and take no more than the Trade Union rate of pay!

These Shop Clubs are institutions of great value to both employers and employed; and nothing must be done to hinder the growth of those—the very great majority—that fulfil reasonable conditions. The men get better value for

their money from a well-managed Shop Club than from an outside Society; they are more sure of finding their berths kept open when they are ill than if there were no connecting link between the sick-bed and the works; and they are freed from the nuisance of the "whip round" that is made in most places where there is no recognized club, for every man who has to declare himself sick. Both masters and men, moreover, derive incalculable benefit from the friendly relations engendered by the existence of every properly constituted and managed Works Club; and no sensible man will ever raise any objection to an employer insisting upon his men availing themselves of the opportunity thereby afforded of providing against a rainy day. For it is not the thrifty man who needs or objects to compulsion; it is the thoughtless man who needs it, and the Trade Union official who objects to it.

Low-Power Gas, High-Power Enterprise, in Brazil.

In England we have not been in the habit of turning our eyes to Brazil for a lesson in gas management; it has hitherto been the other way about. But we are compelled to do so this week; and for drastic methods of meeting the competition of electricity, we commend to the notice of our readers the new, complete, and far-reaching policy of the Directors of the San Paulo Gas Company, which policy has been as sharply carried out as it was sharply conceived. What they have done to ward off the attacks of the wealthy Company who will challenge them in the field of lighting comprises the best of everything, and more, that has been done, and is being done, in England to expand the power of the gas industry. In short, the Company have torn themselves completely asunder from old conservative notions (the clinging to which in these days will not operate to the advantage of any gas company), and have adopted a progressive policy of a very high order. We trace in this the hand of the Company's Consulting Engineer (Mr. A. F. Phillips) and of the local Manager (Mr. Richard Gray), and the liberal co-operation of a far-sighted Board.

For a full description of the protective armour which has been applied to the undertaking, the reader must be referred to the report of the annual meeting published elsewhere in this issue. Here we can only epitomize what is there stated. In the first place, the Company have purchased the patent rights for incandescent gas lighting in San Paulo; and since then they have pushed the system with energy. During last year, there was a substantial increase in the Company's expenditure under the head of distribution; and it turns out that the explanation of this is that the Company have been actively assisting in the substitution of fittings of modern type for inferior fittings in private houses. The result is that to-day, Mr. Phillips says, "practically all the private "lighting is done with the incandescent gas-burners." This being the remarkable position, 17-candle gas is no longer required; and 14-candle gas is to be the future supply in San Paulo. The street lighting, too, is to be transformed to incandescent lighting; and the price for both public and private lighting is going to be reduced. The advantages which the consumers and the city will immediately derive will considerably outweigh those which the Company will gain; but the latter have assured their future, and that is worth something to which no one can assign a money value. The material character of the benefits which have been conferred by the Company are fully set out in Mr. Phillips's report, and must be read. We can heartily congratulate all concerned in this splendid example of really active gas management.

Fate of the Street Subways Bills of the Session.

It is a very human propensity of the average man to call upon his "gods"—in these latter days, his Governments, national and municipal—to remove instantly any particular ill of the body politic which may be uppermost in his mind for the moment. During the last two years, the Londoner has in his walks abroad, especially in the City, been much incommoded by trench-work for the accommodation of certain pipes and wires, laid with the ulterior object of facilitating the satisfaction of his own demands for electric light and improved telephone accommodation. Forgetting this latter consideration, the wayfarer in the Metropolis at times complained loudly and bitterly of the inconvenience he was made to suffer through and by reason of these street works, and in his haste he demanded that somebody should provide subways for containing all the pipes and wires that are now, or ever may be, needed. The Metropolitan Authorities were eager to give ear to so very reasonable a prayer. Both the London County Council and the Corporation of the City of London framed Bills for promotion in the present session of Parliament, which, in different ways, sketched out means whereby this grievance of the wayfarer might be redressed. Meanwhile, the nuisance had abated itself in the ordinary course; and the public, which is, on the whole, fairly well represented by Parliament, had nearly forgotten about the trouble by the time the provisions of the Bills came up for consideration in cold blood. When this was in the Orders of the Day, a good many people discovered that the proposed remedies would prove to be far more objectionable than the disease.

According to their manner, the London County Council sought to harness the motive-power of the popular complaint to a magnificent scheme of legislation which, among other alterations of the law, would have given them power to do anything they might deem expedient with the subsoil of any street, and made them owners thereof. This grand idea had to be sacrificed on the second reading, to save the Bill, which accordingly went forward as a comparatively harmless, if useless, administrative measure. Next, the City Corporation had a Bill, the provisions of which we have published, for the regulation of street openings which were admitted to be unavoidable. Unfortunately for this measure, it proved on examination to be aimed at the wrong parties, and to be most absurdly stringent upon innocuous interests. Therefore, it was rejected by the Committee. So end, for the time being, the hasty endeavours of the Metropolitan Highway Authorities to meet the vague wishes of the inhabitants for "something to be done" to stop street pipe and cable works. It is, perhaps, too much to hope, in these days of a cheap and effusive newspaper press, that the general public would stop and think how unlikely it is that a class of public works which has proved indispensable throughout the last hundred years, and is carried on all over the world, should be amenable to drastic suppression on lines that a smart paragraphist can indicate with a few strokes of a ready pen. The pen may occasionally be mightier than the sword; but the navvy's pick and shovel are often in superior requisition.

The End of the Acetylene 'Bus Lights.

The somewhat chequered career of the Phos acetylene omnibus lights in London has suddenly come to an end, and in an unexpected manner, for it is the Lamp Company, and not the Omnibus Associations, who have terminated the experiment. As legal proceedings have been instituted, it is at present impossible to arrive at all the facts of the case; but it appears that last Wednesday week the Phos Company (who had a three years' contract with four of the London Omnibus Companies) gave about forty-eight hours' notice that they would no longer carry out their share of the bargain, alleging as a reason sundry breaches of the contract. It may be suggested as at least a partial explanation of the matter that the Phos Company had to pay for all losses incurred through failure of a lamp—that is, if a lamp failed to light or went out, the omnibus was at once driven back to the yard, and the consequent loss of takings had to be recouped by the Phos people, as well as any fines incurred through the failure. The notice was so short that it was, of course, impossible to replace all the lamps; and the consequence was a wholesale disorganization of the lighting arrangements of the Omnibus Companies. But however much the public may have been inconvenienced by this sudden withdrawal of the lamps, the drivers and conductors of the vehicles cannot have regarded their departure with anything else than pleasure. Besides their pungent odour, the lights had a decided tendency to go out without warning; and this, although it no doubt afforded temporary relief to the drivers, immediately rendered the conductors amenable to the law. The light (when burning properly) was a very bright one; and it is a pity that there should be such great disadvantages attaching to its use. It should not be impossible in course of time to remedy both the bad smell and the habit of going out with which the lamps have up to the present been afflicted; but, however this may be, the crowded streets of London are not the proper place in which to conduct experiments in this direction. Let the lamp be perfected; and then it will be hailed with delight by thousands

upon thousands of people who have so long suffered from the dingy oil-lamps to which they have been accustomed in public vehicles.

Gas Companies and Aesthetics.

A letter under this title, from a Broadstairs correspondent, appeared in the columns of a morning contemporary last Saturday, in which the writer bemoaned the decision of a Select Committee of the House of Commons to permit the Broadstairs Gas Company to remove their works to a site near the railway station, against the wishes of the Council, the ratepayers, and the owners of the estate upon which it is proposed to erect the works. Broadstairs, he says, is one of the few really picturesque little seaside towns near the Metropolis; and it is now proposed to spoil the first impressions of this delightful place by hideous gas-works dumped down so that they may be the first object to catch a visitor's eye as the train slows into the station. "It "will," he asserts, "be like having an open coal-cellar (but "worse) opposite the front door of a gentleman's residence." It is, however, to be feared that there are many gentlemen who would not object to having their coal-cellar (of course, surrounded by a belt of trees) opposite the front door, if by this means they could secure a cheaper supply of coal than would otherwise be the case. "What," asks the writer, "is "the use of striving to preserve the charm of a town, if "Parliament will pay no heed whatever to the representa-"tions of its inhabitants? The site exactly suits the Gas "Company, and so all other considerations must give way. "Is this right? Is this fair? Is this tolerable?" It is to be hoped, for his own sake, that the writer of the letter will find the matter tolerable, for unless the House of Lords take a different view to that of the Lower House, he will certainly have to put up with it.

Municipal Ownership in Glasgow.

In a pamphlet written with the object of proving the desirability of municipal management, the author (Mr. R. B. Struthers) naturally refers at some length to Glasgow, as being the most prominent example in the United Kingdom. He says that "a citizen of Glasgow may live in a municipal "house. He may walk along the municipal street, or ride "on the municipal tramcar, and watch the municipal dust-"cart collecting the refuse, which is used to fertilize the "municipal farm. Then he may turn into the municipal "market, buy a steak from an animal killed in the municipal "slaughter-house, and cook it by the municipal gas on the "municipal gas-stove. For his recreation, he can choose "among municipal libraries, municipal art galleries, and "municipal music in the municipal parks. Should he "fall ill, he can ring up his doctor through the municipal "telephone, or he may be taken to the municipal hospital "on the municipal ambulance by a municipal policeman. "Should he be so unfortunate as to get on fire, he will be "put out by a municipal fireman, using municipal water, "after which he will, perhaps, forego the enjoyment of a "municipal bath, though he may find it necessary to get a "new suit in the municipal old clothes market." Though the author treats the case of Glasgow in this somewhat humorous fashion, a very good idea is at the same time conveyed of the municipal attainments of the city. The list, however, is not quite a complete one, for electric lighting, at any rate, has been altogether left out of consideration. There are still some things in Glasgow which remain in the hands of private enterprise; but it seems as if this will not much longer be the case.

WATER AFFAIRS.

The First Stage of the Session.

THE appointment by the Committee of Selection of the House of Commons last Tuesday of the five members to serve on the Joint Committee for the consideration of the London Water Bill, completed the preliminary arrangements for the important inquiry which will be one of the conspicuous features of the legislative work of the remainder of the session. The members chosen are Sir William Houldsworth, Sir William Arrol, Sir James Kitson, Sir Edgar Vincent, and Mr. M'Crae; and, in association with the Lord's Committee (the names of the members of which were given last week), they will commence their labours soon after the recess. That these would not be light was a foregone conclusion; and it is strengthened by the fact that upwards of seventy petitions have been presented against the Bill. Regarded from a political standpoint, the Joint Committee will be Conservative. Of the five members of the Upper House, only one (the Earl of Crewe) is a Liberal; while of those named above, Sir William Arrol is a Liberal Unionist, and Sir James Kitson and Mr. M'Crae are both Radicals. In an inquiry of this kind, however, business qualities rather than political principles are needed by those who are entrusted with it; and in this respect the selection made has been a judicious one. Sir William Houldsworth, the member for North-West Manchester, is an experienced man of affairs, who, at a comparatively early age, as then regarded, was entrusted with the management of an important cotton-spinning concern which has been in his family for about a century. As to Sir William Arrol, one has only to look at the Forth Bridge for a testimonial to his capacity for business. Sir James Kitson is a great iron-master; and Mr. M'Crae is the head of a large establishment in Edinburgh, and was Chairman of the Finance Committee of the Corporation. He will necessarily take a keen interest in the money portion of the inquiry, as will also Sir Edgar Vincent, who, as Financial Adviser to the Egyptian Government, will have gained experience which must be specially valuable. If the combined efforts of such a Committee as this do not result in moulding the London Water Bill into a much more acceptable measure to all parties concerned than it now is, we shall be forced to the conclusion that the task is impossible of achievement.

Apart from the question of the London Water Supply, some good progress was made with general water legislation in the first portion of the session, which ended last Wednesday. Dealing first with the Metropolis, the Grand Junction Water Company succeeded in getting their unopposed Bill through to the report stage. As originally introduced, it was to enable the Company to extend their limits of supply and acquire additional land; but the provisions relating to these matters were struck out, and the object of the measure was confined to authority to create and issue £100,000 of additional debenture stock, with the customary borrowing powers. Similar progress was made with the Kent Water Bill, which was to authorize the Company to enlarge their limits, obtain some further land, and raise more money. The amount originally named was £300,000; but, in deference to the opinion expressed by the Local Government Board, that the Company should confine themselves to works absolutely necessary, it had been reduced to £150,000. The Bill was opposed by the London and Surrey County Councils and by various Local Authorities. But, as will be seen by our "Parliamentary Intelligence," Mr. Wason's Committee passed it as a carrying-over measure, pending the result of the coming proceedings on the Government Water Bill, and gave the Company the reduced capital they applied for. No evidence was needed beyond that of the Chairman of the Company (Sir W. Hart Dyke, M.P.), Mr. Alexander Dickson, a Director, and Mr. W. Morris, the Engineer. In each Bill a clause was inserted specifying that in the event of the undertaking being purchased otherwise than by agreement at any date not later than the 6th of June, 1906, the Company are not to claim any advantage resulting from the passing of the measure; but they may bring into account the actual amount of any capital expenditure made in exercise of the powers conferred upon them by the Act.

With regard to the Provinces, our "Gleanings from the "Committee Rooms" during the past few weeks have furnished sufficiently full records of the progress of several Bills. Two matters may, however, be again briefly noticed—the success of one Corporation and the failure of another. The differences which have for some time existed between the Devonport Corporation and the Water Company are to be ended by the transfer of the undertaking and the dissolution of the Company after more than a hundred years' existence; and the Wolverhampton Corporation have been for the second time worsted in their fight with the neighbouring Local Authorities over the scheme for improving the water supply of the borough. This will now have to be done with the assistance of Birmingham, at an increased cost, as the promoters urged, to the ratepayers of Wolverhampton. The first stage of the session, therefore, has put the quietus

upon two of the most important Bills in the list. We look forward with interest to the results of the second.

The Water Diviner's Gift.

We have from time to time published in the "JOURNAL" brief records of cases in which the services of the "diviner," or "dowser," have been requisitioned with the object of indicating sources of water for public or private supply. These records, as far as we can remember, have always been confined to a bare narration of facts, without any expression of opinion as to whether the results obtained were due to some mysterious agency operating upon a human being specially susceptible to its influence, or were merely the outcome of a fortuitous combination of circumstances. We preserved an open mind on the subject, for the reason that every-day experience, to say nothing of the Transactions of the Society for Psychical Research brings us face to face with phenomena which, with our present limited knowledge, we are unable to explain satisfactorily. "Dowsing" is one of these; and the Council of the Society above referred to considered it of sufficient importance to have it specially investigated by Professor Barrett, of Dublin. In one report, he stated that, out of 105 cases of divining by the British professional dowsers, 95 were successful. In another, he expressed the opinion that it is in comparatively shallow wells—say, 50 or 60 feet deep—and for supplies intended for domestic purposes, that diviners are most successful. These results, however, did not deter Professor Barrett from saying that some of the advertising dowsers are "unadulterated "humbugs." On the other hand, there are many men now practising the art—or shall we say exercising the gift?—of divination who, as Mr. Mansergh acknowledged in his Inaugural Address at the Institution of Civil Engineers at the opening of last session, are men of repute in many quarters, whose work "cannot be lightly pooh-poohed or "summarily ignored."

And its Responsibilities.

Assuming that the diviner possesses a peculiar gift, it behoves him to be careful how he makes use of it, or it may bring him into trouble. This was the case with Mr. S. T. Child, of Capel St. Mary, near Ipswich, whose business as a miller was diversified by an occasional turn at dowsing. Suffolk people appear to be believers in this method of finding water; and Mr. Child's services were sought by a lady who wished to have an additional supply for her house near Stowmarket. He visited the place, and indicated the spot for the well—adding, it is alleged, that water would be found at a depth of 25 to 30 feet. The well was sunk 48 feet, but no water was found. The failure led to proceedings at the Ipswich County Court, which resulted in judgment against the diviner for £42, on the ground that his statement as to the depth at which water would be met was made "reck-"lessly." This decision was appealed against; and the matter came before the Lord Chief Justice and Justices Darling and Channell on March 20. As will be seen by the report which appears in our "Legal Intelligence," the appellant was unsuccessful. He had returned his fee of 25s., and he has now to pay the expenses attending the sinking of the well and the costs in the action. At first sight, it seems hard that an error of judgment in a matter for which so small a fee was paid should have entailed this heavy penalty; and the Lord Chief Justice confessed that if he had been the County Court Judge he should have hesitated to come to the conclusion that Mr. Child did more than "express an "opinion" as to the distance below the surface at which water would be found. Probably this is all that was really intended; and if, as Mr. Justice Darling remarked, Mr. Child had said "in my opinion," he would not have been liable in law. Instead of using this guarded expression, he made a definite statement of fact, action taken upon which by another led to damage, for which he became responsible, for the reason set forth by Lord Alverstone in giving judgment. The case will serve as a warning to other diviners to exercise caution when advising clients to take action upon the indications of the hazel-twig, or the consequences may be more serious than those attending Mr. Child's predictions.

An Italian Water-Supply Scheme.

It is not a little singular that while our Legislature is occupied, on the initiative of His Majesty's Ministers, with the question of the water supply of the Metropolis, the Italian Chamber of Deputies has before it a scheme proposed by the Government for improving the supply in the south-eastern portion of the Peninsula; and our contemporary the "Builder" recently gave an outline of it from particulars contained in an Italian technical publication. It appears that it is divided into five principal parts, subdivided into sixteen subordinate projects. The general estimate amounts to £6,520,000, which will cover the construction of the local reservoirs and the conduits or pipe-lines necessary for connecting them with the centres of habitation, but not the cost of conveying the water into the houses. The aqueduct will commence at the springs of Caposele, cross the Apennines at the pass of Conza, with a tunnel about 140 yards long, from which point it will follow the Valley of the Ofanto for a distance of 30 miles, where a junction will be made for Foggia, the capital of the province of that name. This will comprise an open channel 44 miles long, with about 180 miles of pipes and 12 reservoirs for 21 centres of population. From the junction for Foggia, the main aqueduct will be carried towards Bari, situated on the Adriatic shore, for a distance of 132 miles, with 15 branches and 41 reservoirs to supply 56 centres. For the province of Lecce, there will be a principal canal 11 miles long, with 400 miles of secondary communications; and it will feed 34 reservoirs for the supply of 141 centres. The entire project comprises nearly 165 miles of principal canals and about 870 miles of branches. The main stream of water will, it is supposed, pass through 37 miles of tunnelling, 117 miles of trenches, over 4 miles of bridges and arches, and in 5½ miles of metal syphons. The expense of the scheme will be divided thus: Foggia, £1,023,000; Bari, £2,386,000; and Lecce, £3,111,000—total, £6,520,000.

Wood-Gas for Power Purposes.—M. Deschamps has given, in the "Génie Civil," a description and sketch of a wood-gas plant at a French works, which for the last few months has provided the gas for driving a 50-horse power gas-engine with satisfactory results. A larger plant for a 200-horse power engine is being built. The consumption of wood amounted to about 5 lbs. of freshly-hewn wood per horse-power-hour. The heating value of the gas ranged from 30 to 54 units of heat per cubic foot. The gas differed from ordinary producer gas only by the higher proportion of carbonic oxide which it contains.

Strache Water Gas.—We learn from "Il Politecnico" that the commune of Broni, in Pavia, has for some weeks been supplied with water gas on the Strache system. The event is of some importance from the fact that, as far as we are aware, this is the first plant of the kind erected in Italy. When the municipal authorities of Broni had the matter under consideration, they instructed Signor Pompeo Tarantola, of Milan, to ascertain the conditions under which the Strache system was working in some of the towns in which it has been installed; and accordingly he inspected the plant at the Vienna Hospital and at the Communal Works at Pettau. He subsequently prepared a scheme for the construction of works on similar lines for Broni, and entered into a preliminary contract with the Company holding the Strache patents, and made the requisite arrangements for the supply of the requisite storage and distributing plant. The Communal Council of Broni approved of the plan early in 1901, and it was then submitted to, and passed by, the higher authorities. Tenders were next invited; and these were in due course obtained. The contract for the construction of the gasholder and the laying of the pipes was awarded to Signor E. Colombo, of Lecco; and that for the buildings, gasholder tank, and purifiers, to Signor G. Quirici, of Stradella. Work was commenced at the end of August, and finished early this year; so that on the 2nd of February the streets of the town were lighted. There are now 100 public lamps, 30 of them having an illuminating power of 100 candles, and the remainder being of 50-candle power. Applications from about a hundred private consumers had been received; and it was expected that the number would be trebled very soon—general satisfaction being expressed with the light. The generators are equal to the production of gas with the use of coke, gas coal, or lignite; the yield varying from about 8500 cubic feet down to 6400 and 3500 cubic feet of gas per 220 lbs. of the respective three fuels. The heating power of the gas is 2500 calories; its temperature of combustion 1700° C.; and its lower limit of explosiveness 12·5 per cent. Its slight calorific power and the greater percentage of gas in the explosive mixture are largely compensated for by its low cost price. The actual selling price is about 5s. per 1000 cubic feet for illumination, and 3s. 2d. per 1000 cubic feet for heating and motive power. The cost of production, reckoning 3½ millions per annum, may be estimated at 1s. 4d. per 1000 cubic feet, exclusive of interest and sinking fund repayments; coal costing 2s. 8d. and coke 3s. per quintal. It is stated that during the current year similar works will be constructed for the Casteggio Municipality, in accordance with plans prepared by Signor Tarantola, as soon as the necessary authorization can be obtained.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

Last week was a short one on the Stock Exchange as in every other commercial centre; but it was far from being devoid of interest. Two events of some importance occurred during its currency, which might fairly enough have been expected to produce a revivifying effect on the sluggish markets. These were the visit of the Boer official representatives to Pretoria in search, presumably, of peace, and the successful operations against Delarey. But these cheering factors resulted in no outburst of enterprise—a fact which seems clearly to illustrate how very cautious operators have become. Almost everything, however, was fairly firm; Consols showing the way. There being no fresh business to speak of, the settlement of the fortnightly account before Easter engrossed most attention; and when this operation had been concluded, the attendance thinned down to very small proportions. The Money Market was firm; there being a strong demand for Stock Exchange purposes and other requirements common at the close of the quarter. In the Gas Market business cannot be said to have been very brisk; but certainly, considering the season of the year and the average load of transactions prevailing for the last two or three weeks, it was better than might reasonably have been expected. So far as any general tendency is to be inferred from the changes which actually took place in quotations, the disposition was towards easier prices, for the few alterations noted were in the downward direction, although they were slight in degree. But this may arise from only stocks which were a little weak coming into the market, for there are probably several issues which are ready to rise if they only get a chance. In Gaslights, some moderate business was done daily in the ordinary; the best price being 91¾ on the opening day, and the closing mark being 90¼, with a fall of a point in the quotation. The secured issues, too, were not strong; and the preference receded a point. South Metropolitan was not busy; and it encountered more disfavour—being marked on Thursday as low as 119. Here, too, the quotation was lowered a point. In the Suburban and Provincial group, there was hardly any business, and no change. The same conditions attended the Continental Companies, which were quite devoid of incident. And there is nothing to chronicle in regard to the undertakings located in the remoter world. The Water Companies were quite quiet; and the only changes were two or three small variations in adjustment of *ex div.* quotations.

The daily operations do not call for detailed notice.

ILLUMINATIONS FOR THE CORONATION.

The subject of public illuminations for the King's Coronation suggested a lecture by Mr. Edwin O. Sachs, recently delivered before the Society for the Encouragement of the Fine Arts. The lecturer truly remarked, in introducing his subject, that it was the first time anyone has spoken on the decorative side of illuminations, although it is a business that will bulk largely at the Coronation festival. He commented on the fact that this is a kind of study to which Continental artists pay great attention, whereas in England not a single prominent artist has ever taken it up seriously. This is, undoubtedly, one of the great weaknesses of English art, that it has so little to do with the ordinary, and even the special, needs of common town life. Mr. Sachs essayed to open up his subject from the architectural side; but he confessed to entertaining a prejudice in favour of electrical illuminations, which does not strike one as being quite the proper preparation for such a task. Surely, the method by which an effect is produced is to be judged only as the means to the desired end. No accomplished architect would willingly confess to a predilection for a particular building material, for all purposes indiscriminately. He would rather profess entire willingness to apply whatever material might be found the most suitable for the purpose intended to be subserved; and this is equally the correct view to take of illuminations.

Mr. Sachs, however, went on to admit his personal interest in the E.L.B. system of electric lighting, which is quite right and proper. He declared that by this system the difficulties that had hitherto existed, of using electricity for illuminations, have been at last surmounted, which is as may be. At any rate, the assertion serves to define the speaker's position in relation to his subject. It may as well be remarked at once, that this "new" system of electric lighting, as Mr. Sachs termed it, is not particularly novel to-day, having been before the public for some years. It depends upon the employment of a peculiar method of supplying current to incandescent lamps, consisting in the use for this purpose of what is called an "electric lighting board"—the initials of the words give the short title of the system—in the substance of which the conductors are buried. The lamps are provided with spikes for sticking into the board, and thus the electrical connection is made. The device is chiefly used for theatrical work, and displaying names and scroll or other patterns in lines of lamplight. We have no desire to depreciate the system, which is doubtless capable of pretty and ingenious applications; but it obviously does not cheapen electrical illumination, or remove the "stillness" which is generally recognized as a defect of all illuminations by the electric light.

Mr. Sachs briefly recounted the various methods of public illumination by small lights which have from ancient times been esteemed to be the proper embellishments of buildings on "bonfire nights." The foundation of all good town illumination is the outlining of the principal architectural features of the buildings by rows of lights. The lecturer spoke enthusiastically of the fine effect produced on the occasion of the celebration of the eightieth birthday of the Emperor William I. in Berlin, when, by special arrangement—which may be translated "Police Order"—every window sill had six or eight lighted candles placed upon it. "He considered that that simple but well organized effect was probably the grandest illumination that had been produced for many a year." Mr. Sachs is a German, and so is easily satisfied in small things. Still, it is well that the public should be reminded how easily, and at what small individual cost, a really good effect of town illumination is producible in this simple way. The next step in an arrangement of this kind is to enclose the small lights in coloured lanterns (which at once gives scope for a good deal of taste in the selection and treatment of the colours). So long as this kind of illumination is undertaken by individual householders, who will light up at the proper time and look after the lamps, it cannot be improved upon. Besides, it gives everybody who has a window a legitimate pleasure in doing his part in the festival, which is a generous feeling greatly to be encouraged.

So far, we have not touched the proper field of gas or electric illumination. It was when the candle or the oil-lamp was multiplied by thousands, and used in decorative illuminations on a large scale, that the method broke down, by reason merely of the length of time occupied in lighting-up. An enormous saving of time in the lighting-up was effected by substituting gas-jets for the older illuminants inside the coloured lanterns; and inasmuch as these must in any case be mounted upon rigid iron frames, these could be gas-pipes without interfering with the scheme of decoration. Lastly, incandescent electric lamps were made use of in the same fashion; and to the familiar attraction was added the new phenomenon of the instantaneous glowing into light of line after line of these pretty coloured bulbs. But those who had anything to do with this business were appalled at the enormous cost. It will be remembered that much of what should with frugal husbandry have been the substantial surpluses of the last series of South Kensington exhibitions was squandered in this way. The momentary pleasure of the crowd, in seeing the instantaneous lighting-up of the small electric lamps, was a poor set-off to the £80,000 or so which the lights swallowed up every month the show was open; and to this extravagance was partly due the discredit into which the administration of these otherwise successful enterprises eventually sank. No advance, it is safe to say, has since been made upon these South Kensington electric illuminations; and for the very adequate reason that no self-supporting show could afford it.

The succeeding step in the matter of illuminations, to which Mr. Sachs alluded, was the large class of devices that can be generally termed "transparencies." Of course, the smallest coloured lamp or Chinese lantern belongs to this category, in which it is essential that the light itself is not directly seen. From this consideration it follows that the nature of the light is not material; the only things required of it being that it shall be suitable and effective. Hitherto, whatever might be the kind of transparency, whether a design on a strained membrane of paper or translucent cloth, or a device in crystal prismatic drops, no light has been found to beat the simple, flat-flame gas-burner. It is only necessary to cite examples where incandescent electric lights are used in transparencies, always with an unmanageably "spotty" effect, to prove this contention so far as electricity is concerned. Electric arc lighting is, of course, "out of it" entirely for this use. The suitability of flat-flame gas-burners for transparency illumination is due to several features of this method of burning gas. It is not likely to fail or give trouble in any way, if only the very simple requirement of proper ventilation is provided. A little blowing about of the flame is rather an advantage than a defect, as imparting some "life" to the show. The intrinsic brilliancy of the flame is not so unmanageably great that there need be any suspicion of spottiness of effect; and the light is cheap, to any power likely to be wanted. It is one of the commonplaces of our thoroughfares that the stillness and lifelessness of display electric lighting, which is meant to catch the eye, is usually corrected by the abominable expedient of sudden periodical extinctions and flashings; but not the most perfervid partisan of electric lighting could justify this distressing application of it.

There is at least one kind of transparency to which electric light can be better adapted than gas, and in which its obvious suitability conduces greatly to the success of the effect. This is in Chinese and celluloid lanterns disposed tastefully as pendants upon catenary curves formed by the electric light cables, which sway in the night wind and go where rigid gas-pipes could not soar. Those who love electric illuminations wisely would be well advised to bear in mind that theirs is the possibility of the beautiful catenary curve, and therewith be content.

As regards the architectural outlining of buildings, especially for temporary illuminations, there is nothing to approach gas, especially in respect to both economy and safety. Of course, the electric lighting of a tower like that seen last year at the Glasgow Exhibition is extremely beautiful, done as well as that was done.

But it is a very serious and really hazardous business, not to be lightly entered upon or carried out in a hurry. For a single night's display, it would be ridiculous to attempt anything like it; and unless thoroughly well done, it would be better left alone. The risk of fire, to name only one consideration, is not a trifling one. The electric wires, hastily nailed down, are liable to be punctured, and a wet night will increase the danger of a disastrous short-circuit. Why electric lighting should be used in this way, where gas is available, cannot be explained in a reasonable way. Mr. Sachs, it should be said, approves of gas outlining for architectural illuminations, with the proviso that only the very simplest forms are followed. Otherwise, the results are apt to be bad. As a matter of fact, the difficulty of providing a proper access of air to exposed gas-jet illuminations where the lines cross over one another prevents indulgence in very complicated designs. Mr. Sachs notices that there is a development of gas outlining consisting in the use of a small burner. He probably means the triple jet, which we believe Mr. Sugg introduced. He did not think this improves matters to any extent; but he would change his opinion if he could see the two fittings in a strong wind.

Finally, the lecturer was fain to confess that he had little hopes of electric illuminations making much of a show even in the West-end of London at the coming Coronation. He thought that "the Electric Light Companies in London did not quite seem to have grasped the possibilities by which they could make money by inducing their customers to illuminate by electricity instead of gas." The truth of this matter probably is that the Electric Light Companies know quite well that there is no money in public illuminations; while any failure, which might be due to hasty fitting, would do them far more harm than any profit they might derive from a few special connections, The system of electric distribution is not adapted to illuminations. Connections for them do not exist, and would have to be made, which is not convenient. The possibility of an accidental shock or two being delivered to passers-by would not contribute to the safety of the crowds. On the whole, therefore, it would appear desirable to keep electricity not only out of sight, but out of the way, on the night of the Coronation, unless all the arrangements for displaying electric illuminations effectively are very carefully made.

TYRANNY OF TRADE UNION OFFICIALS.

A CASE of considerable interest to employers and workmen was recently before Mr. Justice Walton and a Special Jury at Cardiff; the hearing extending over five days, ending the 24th ult. The action was brought by a labourer, named Giblan, against the National Amalgamated Labourers' Union of Great Britain and Ireland, and against Williams, General Secretary, and Toomey, Local Agent and Secretary, of the Union. The plaintiff claimed damages against the defendants—alleging that they had unlawfully, maliciously, and with intent to injure, conspired to obtain his dismissal by sundry employers, and to induce others not to employ him, and had likewise conspired to induce, and had induced, workmen to refuse to work with him. The Jury found that Williams and Toomey, acting together, at various times called out, or threatened to call out, the Union men unless Giblan was discharged; that they did so to prevent Giblan obtaining or retaining employment; and that they did so, not on the initiative of the men, but because the Union officials wished to injure him. The Jury assessed the damages at £100; but there remains to be argued the point of law as to whether Williams and Toomey acted within the scope of their authority as servants of the Union, and so rendered the funds of the Union liable for the assessed damages.

Some newspapers have written about the verdict in the case as if it decided some entirely new point in regard to the rights of Unions to order or threaten strikes with a view to preventing individuals from being employed. But there is nothing in the case not covered by the judgment in *Quinn v. Leathem*, so far as we can see. Its interest lies rather in, first, the gross abuse of the powers possessed by Union officials, as revealed in the evidence; and, second, in the question, as yet undecided, as to whether such abuse, carried on by the officials, as officials, was *intra vires*, and, therefore, a ground of action against the Union.

Put briefly, the facts of the case were these: The plaintiff was formerly a Local Treasurer of the Union. He failed to account properly for some of the monies paid to him. Whether the default was due to deliberate dishonesty on the part of Giblan, or only to culpable negligence in the keeping of his books, did not transpire in the trial of the present action. But at any rate the Union elected to proceed against him in the Civil and not the Criminal Courts, and the action was not taken until he had failed to keep to the terms of an agreement made by him with the Union as to repayment of the amount he was in default. Judgment was obtained against Giblan for the amount unpaid; and he refunded a further £4 under the judgment. Two months afterwards, however, the General Secretary of the Union got him dismissed from his employment by threatening to call out the other men—on the ground that Giblan's contributions were in arrear, which in point of fact they were not. In consequence of this, Giblan made no further repayment to the Union, who subsequently obtained a judgment summons against him. The summons was, however, dismissed with costs, owing to a technical flaw. Thereafter, the Union expelled Giblan; and the General Secretary, assisted by the Local Agent, made it his business to see that the man got no employment, either on Union or non-Union jobs, "anywhere on the Bristol Channel." Wherever the man went, the Secretary or his Agent followed; and men who, until the Union official appeared on the scene, were perfectly willing to work with Giblan, went out on strike, or threatened to do so, until he was dismissed.

A more deliberate and cruel piece of persecution, or a greater pervertion of the enormous powers possessed by Trade Union officials, it would be difficult to find. They would not let the man earn money wherewith to pay what he owed, and when, owing to a technical error, a summons against him was dismissed, instead of applying for a fresh summons, as was open to them, they expelled the man from the Union, and then followed him up and down the Bristol Channel to see that no one employed him. That such conduct, when proved, is actionable, was decided by *Quinn v. Leathem*, whereby it was held that to require an employer to employ, or not to employ, any particular man or men, or to call out his men on strike, without the justification of a previously existing trade dispute, is to infringe the rights of the employer to a free course of trade, and the corresponding right of the particular man to be employed; and to combine to do such things is a conspiracy.

The present case of *Giblan v. National Labourers' Union* is distinguished from *Allen v. Flood* by the fact that the Jury found that Williams and Toomey had acted together in calling out, or threatening to call out, the men; whereas Allen, by himself, without agreement with any other person, obtained the dismissal of Flood by means of such a threat. The importance of the judgment in the Flood case has, in fact, been diminished to a mere shadow of its former self by the later judgment of *Quinn v. Leathem;* and Trade Union officials are now being taught that the employment of the very considerable power possessed by them for the persecution instead of for the protection of working men is a much more dangerous game to play than they formerly believed it to be. In the present case, it remains to be seen whether the officials have, in abusing the powers of the Union, rendered its funds liable for the damage inflicted upon the victim of the abuse. Should that be decided in the affirmative, every real friend of the working classes will rejoice.

ELECTRIC LIGHTING MEMORANDA.

Disappointment at Kingston-on-Thames—A Town's Meeting—Strong Criticisms of the Corporation—An Investigation Demanded.

THE observations made in this column last week, respecting the disappointing character of much municipal electricity supply, are borne out by evidence continually coming to hand. The latest case in point is that of Kingston-on-Thames, where, as will have been gathered from what has already appeared in the "JOURNAL," the tide of instructed public opinion is rising fast against any further rate-aided extension of the Corporation electric lighting in the streets. Kingston is one of the places where municipal electric lighting was eagerly adopted with a view to economy of the rates, not less than for the embellishment of the town. Everyone acquainted with it must agree with the proposition that if electric lighting could pay in any country, or semi-suburban, town, of the same population, it ought to be here. No doubt, this impression was very generally shared by the townspeople, and determined the issue at the particular juncture when the electrical speculators drove the Town Council to choose between providing the electric light themselves, for the benefit of the ratepayers, or permitting a Company to come in, as in the neighbouring Thames-side town of Richmond. Unfortunately for Kingston, experience has not justified the expectation. Although it is a very crowded, busy town for its size, with a fringe of good, rapidly-growing suburbs, and has greatly improved its position in the County of Surrey, the electric light is a commercial failure. Like so many other municipalities similarly circumstanced, the Corporation have adopted the economic fallacy of taking from Peter to pay Paul, by going in extensively for street arc lighting. This has the effect of apparently splitting the loss on the working of the concern. But, of course, the money needed for the support of the undertaking all has to come out of the same pocket—that of the ratepayer; and he has found it out.

Matters were brought to a climax in Kingston local politics by the recent decision of the Corporation to extend their arc lighting along the main roads to the boundary of the borough, involving the erection of 35 additional lamps. When this decision became known, active and weighty opposition to it immediately arose, and culminated in a requisition being addressed to the Mayor to convene a town's meeting for the purpose of considering the general subject of the Corporation's position in regard to the electric lighting undertaking. The meeting was held, and was so attended and conducted as to leave no room for doubt as to the state of public opinion on the subject. As is usual in such matters, the Corporation have drifted along, committing themselves and becoming committed almost inevitably to an ever-increasing outlay on capital account for plausibly recommended extensions, while the revenue account showed also an increasing loss. The Electric Lighting Committee were £2800 to the bad last year. Still they were constrained to go on, in the vain hope of overtaking a balance on the right side somewhere, which is the veritable Will-o'-the-Wisp of municipal electric lighting ventures. They did so, while clinging to the fond illusion that the Corporation would get the arc lighting cheaply at the stated charge of £20 per

lamp per annum, while the estimated cost was £16 16s. per lamp. This also is the common practice. Unhappily, the facts belie the estimate. It is admittedly very difficult to get at the actual cost of municipal arc lighting; but by the simple process of taking out from the accounts the true cost of the unit in Kingston, and adding £5 per lamp for carbons and repairs, one of the critics of the Corporation has made it out that the lamps really stand the ratepayers in £54 apiece per annum. This, it will be remembered, agrees very well with the Hastings figure.

The cost of working the undertaking at Kingston has been altogether above the estimate, which is one end of the stick, while the volume of private business secured is most disappointingly small—which is the other end. Meanwhile, for ten years previously to the introduction of Corporation electric lighting, the lighting rate of the borough never exceeded 6d. in the pound, whereas it has ever since been higher, and last year it was 10d. The rateable value of the borough has considerably increased; so that the actual charge is even more than the figure indicates. The residents in the roads threatened by the extension scheme, which are mostly of a rural or river-side character, protest against it strongly, as tending to give these beautiful thoroughfares a "Tottenham Court Road" aspect. Some of the residents are Stock Exchange men; and these were represented at the town's meeting by speakers who declared that, the municipal electric lighting having proved a white elephant, it would be prudent for the Corporation to follow the Stock Exchange rule and "cut the loss" before matters went from bad to worse. Unfortunately, it is notoriously one of the weaknesses of municipal trading that this excellent rule cannot be followed, for fear of public opinion. Local politicians dare not own to having been mistaken in countenancing a certain course of action which has turned out to be bad, lest they should themselves be turned out. In this respect, a trading corporation is exactly like the directorate of a mismanaged company—always more fertile in explanations, and in adroit devices for managing a meeting of dissatisfied proprietors, than in administering the affairs of the concern.

Thus it is that at Kingston the fact of certain prominent local persons, and the leading local newspaper, having once applauded the electric lighting undertaking at the period when the promise of its early youth was yet undimmed, was thrown in their faces at the town's meeting, as though it were a complete answer to the promptings of experience. Is, therefore, the Bourbon principle the only proper one in politics, and must public men never learn wisdom? The damning fact of the situation is that the Corporation are proposing to deliberately extend the losing branch of their electric lighting business, with the object of making a show of profit to deceive the ratepayers as to the true state of the business. Besides, in so doing they sacrifice the interest of good street lighting, which can be better done with four times the number of incandescent gas-lamps to the mile, at a saving of £150 per mile in cost. As a critic of the Corporation well asked, What advantage are the public going to get for the extra outlay? The meeting carried resolutions emphatically condemning the electric light policy of the Corporation, demanding the stopping of the proposed extensions, and calling on the Town Council to institute a searching investigation into the whole concern. It is a significant commentary on the situation of the electric light in Kingston that the adjacent authority of Surbiton have determined to keep out of the business.

We have received from the "Builder" office a book entitled "Gas and Gas-Fittings," by Mr. H. F. Hills, F.C.S.—price 5s. It is one of the "Student's Series" issued by our contemporary, and is a handbook of information relating to coal gas, water gas, power gas, and acetylene, for the use of architects, builders, and gas consumers.

We learn that 36 applications have been received for the post of Superintendent at the Swan Village Gas-Works, Birmingham. Some of these the Engineer (Mr. Henry Hack) has selected to wait upon him; and from this number he will choose half-a-dozen to have an interview with the Gas-Works Sub-Committee on the 10th inst., when the final selection will be made.

It will be remembered that recently, Messrs. Farebrother, Ellis, and Co., offered for sale by auction the Pimlico station of the Gaslight and Coke Company, consisting of upwards of 4 acres of freehold and leasehold property, with a frontage of 320 feet to the Thames. The biddings, however, did not go beyond £100,000 (£20,000 below the price required); and the property was in consequence withdrawn. We now learn that a private sale has been effected; but the sum paid has not transpired.

Commenting on the passing of the Bills of the Commercial and South Metropolitan Gas Companies, our contemporary the "Builder" expresses surprise that no effort was made during their progress to set up a standard for the calorific power of gas. The writer says: "In view of the fact that gas is now mainly used, not for producing luminous flames, but for heating purposes and for incandescent lighting, it is not surprising that the reduction in the illuminating power was not opposed; but it is somewhat remarkable that no effort has been made by the representatives of the consumers to introduce a heating power standard. The heating value of gas can be determined readily and accurately; and with the reduction in illuminating power there is great danger of a reduction in the calorific value of the gas, and a consequent decrease in its value for heating, cooking, and power purposes."

OBITUARY.

The Uxbridge Gas Company have lately lost by death their Chairman, Mr. William Fassnidge, who was instrumental in establishing the undertaking. The deceased gentleman had just entered his 77th year.

The death took place recently, in his 60th year, of Alderman Alfred Cooke, Chairman of the Leeds Corporation Water Committee—a position for which he was chosen on the retirement of Mr. Edwin Woodhouse. He was at the head of the well-known colour-printing business in Leeds. He entered the Corporation in 1883, to represent East Hunslet, and was Mayor in 1890-91. He was an excellent man of business, and full of tact; and it was largely due to him that a conference was arranged between the discontented gas workers and the Gas Committee, which prevented a repetition of troubles which had seriously inconvenienced the public on a previous occasion.

PERSONAL.

Mr. J. Wilson, in the service of the Sowerby Bridge District Council, has been appointed Manager of the Thorne (Doncaster) Gas Company.

Mr. J. C. Mount has been appointed Surveyor and Water Engineer to the Lancaster Corporation, at a salary commencing at £300 per annum, and rising to £350 in two years. He succeeds Mr. John Cook, who has obtained the position of City Engineer at Cape Town.

At a recent meeting of the Directors of the Chester United Gas Company, certain official re-arrangements were made, the effect of which will be to relieve Mr. James Pye, who has been in the Company's service since 1854, from all further duties other than those which are purely secretarial. On the same occasion, his son, Mr. F. A. Pye, was appointed General Manager and Cashier of the Company.

It may be remembered that a few weeks ago we announced that Mr. E. Allen Brotherton, head of the firm of Messrs. Brotherton and Co., Limited, had been nominated a candidate for the representation of Wakefield in Parliament—a vacancy having been caused by the succession of Viscount Milton to the peerage, owing to the death of Earl Fitzwilliam. We are pleased to learn that he was successful at the election last Tuesday, when he polled 2960 votes against his opponent's 1972—a majority of 981. The new member, like his predecessor, is a Liberal Unionist; the other candidate (Mr. P. Snowden) belonging to the Independent Labour Party. The city has always been Conservative, and since 1885 the majorities have increased from 325 to the figures above recorded. Mr. Brotherton was appointed an Alderman of the city last November, and it was said at the time that he would have been chosen for Mayor had it not been for the possibility of a parliamentary vacancy occurring during the year. We heartily congratulate Mr. Brotherton on his success.

An interesting ceremony took place on Saturday of last week, at the Victoria Hall, Bolton, on the occasion of an official farewell of Mr. W. J. Smith, who, after about five years' service as Assistant-Manager at the Bolton Gas-Works, was recently appointed Engineer and Manager at Carlisle. Tea was served to over 500 invited guests, including officials and employees in every department of the undertaking, together with their wives or other lady relatives, and a few friends. The subsequent proceedings were presided over by the Mayor (Alderman J. Miles, J.P.), who was accompanied on the platform by representatives of the Gas Committee and of the various sections of the works. After an introductory address by the Mayor, Mr. Henry Eccles said that, while they regretted Mr. Smith was leaving them, they rejoiced at his having secured such an important appointment. The officials and employees in the different departments of the gas-works had wished to show their great appreciation of him, and had united heartily in subscribing to the testimonial which he now had the pleasure of presenting. They had also received a handsome donation from the Chairman of the Gas Committee (Alderman J. Horrocks, J.P.). Mr. Eccles then handed to Mr. Smith a very valuable and elegantly chased tea and coffee service, of solid silver, on a walnut and silver-mounted tray, together with a case containing a set of silver teaspoons and pair of sugar tongs. Mr. Eccles expressed the wish, on behalf of the donors, that Mr. and Mrs. Smith might long be able to enjoy the use of the presents, and look upon them as tokens of the regard felt for Mr. Smith by those with whom he had been associated in the Corporation service. The teapot bears the inscription, "Presented, together with a tray, to Mr. W. J. Smith, Assistant-Manager, by the officials and workmen, on his leaving to take the management of the Carlisle Gas-Works. Bolton Gas-Works, March 22, 1902." In acknowledgment, Mr. Smith said he accepted these beautiful presents with great pleasure, and with most sincere thanks. This was not the first time that he had received practical expressions of their kindness. He had found Bolton men easy to get on with; and this had made it very agreeable for him in proceeding with his work there. He was sorry to leave them; but at the same time he was going to better himself. He must add that he could not express how deeply grateful he felt to the Mayor (Mr. Alderman Miles) especially, for the great kindness he had always received from him. A concert brought the evening to a close.

COMMUNICATED ARTICLES.

FLAME-LUMINOSITY AND "CHEAP GAS."

By A. G. Glasgow.

It is my misfortune to be again in opposition to a pronounced feature of the editorial policy of the "Journal." When I last sought the hospitality of its columns (Dec. 4, 1900), it was to object to the unnatural "wake" the "Journal" attempted over the alleged corpse of the carburetted water-gas industry; and, I am sure, the Editor will readily admit that events have far outstripped the sufficient statements I then advanced. The attitude of the "Journal" I need not further define. It stands expressed in the Editor's own words; but mine was then conservative to the point of weakness, so far has it been exceeded by accomplished fact.

For instance, under the heading of "The Water-Gas Plant at Carlisle," the issue of March 18 reflects our respective lines of vision, paralleled, but separated by a modest difference in cost of 1s. per 1000 cubic feet! With present prices of gas coal on London works and depressed coke values still depreciating, compared with oil for present and long future deliveries at 2¾d. per gallon, there never has been, since the introduction of carburetted water gas into this country, such financial advantage in its manufacture as at the present time.

I now turn to the question immediately responsible for this trespass on your space. It concerns the proposal to cheapen the cost of gas by reducing its illuminating power, based on the claim that the increasing use of incandescent gas-lighting makes flame-luminosity a matter of practical indifference. There is, all will agree, something in this point of view, within its proper limits. Heretofore, it has been generally confined to a movement to abolish enrichment of ordinary coal gas; and I shall deal with this point ere concluding. But a heresy has now arisen, with the powerful support of your columns, which carries the point beyond its intelligent application, and insists upon diluting ordinary coal gas to a standard of 10 or 8 candles or less. As we have no natural gas, this, in the present state of the art, means a large admixture of "blue," or lightly-carburetted, water gas, with corresponding reduction in calorific power. Although some novelty attaches to the proposition in this country, it is a very old question in the United States; and the fact that I have been more or less associated with certain enterprises of this character may justify this communication. I may here name a paper by Mr. F. H. Shelton, published in 1897, giving a readable account of "The Failure of the Commercial Attempts to Supply Fuel Gas in the United States," and dealing with some twenty-seven practical trials.

Again we hear the old cry of "Cheap Gas!" still without the accompanying realization that gas *per se* has no value to the consumer. It is simply a means to an end; a vehicle by which we convey to the consumer a commodity usually described under the terms "light, heat, and power." That gas is cheapest which provides the maximum of this commodity at the minimum price. That mission being fulfilled, the price per 1000 cubic feet of the gaseous vehicle is a matter of complete indifference.

To simplify the problem, we will assume that flame luminosity is of no consequence; that all light is obtained by incandescent mantles; and that the sole commodity purveyed is "heat." The meek consumer—for generations the victim of barbarous and happily obsolete methods of enrichment—is now instructed that since flame luminosity is no longer a prime necessity, it must consequently be destroyed, though the Heavens fall. It happens that this destruction involves the fall—not of the Heavens, but of the heating power. It is impossible to abolish one standard without setting up another. Luminosity being repudiated, we must accept a standard of heat. We, therefore, promise to make good this loss of heat by supplying proportionately more gas for the money. Indeed, we promise more than this. We promise to effect such savings, by diluting the gas, that we can give more heat and light-by-incandescence for the same money.

This is the case for "Cheap Gas" by dilution. Now let us test it with current figures. I will take the cost of London coal gas of 15 candles at 14d. per 1000 cubic feet, with a net calorific power of 560 B.T.U., and will assume its selling price to be 2s. 6d. "Blue" water gas will cost 6d. per 1000 cubic feet, with a net calorific power of 280 B.T.U. On the same basis, carburetted water gas of 18 candles will cost 12d. per 1000 cubic feet, with a net calorific power of 560 B.T.U. These are sufficiently representative figures; but they may be varied within reason without affecting the result. A simple proportion shows that a 10-candle power mixture of coal gas and "blue" water gas will cost 11⅛d. per 1000 cubic feet, with a net calorific power of 467 B.T.U. In order, therefore, to give the same amount of heat for the same money, the selling price must be reduced (in the proportion of 467 : 560) to 2s. 1d., or by 5d. per 1000 cubic feet; whereas the saving in cost of production is 2⅝d. per 1000 cubic feet. In other words, the admixture of one-third of "blue" water gas involves a net loss of 2⅛d. per 1000 cubic feet reckoned over the entire output, or a loss of 7d. per 1000 cubic feet of "blue" gas manufactured, in spite of a decrease of 5 candles in the flame luminosity of the town gas. It will be useful to know how advocates of such a proposition will convert this loss into a profit.

Recent evidence suggests that a confusion between flame-temperature and heating power obscures, in some minds, the limitations of "blue" water gas. It is apparently assumed that, because the flame-temperature of "blue" water gas is as high as coal gas, it will give equal results by incandescent lighting. That it will give an equally intense and beautiful light is unquestionable, but at the expense of proportionately more gas. The flame-temperature of "blue" water gas simply enables it to develop proper incandescence, impossible in the case of producer gas; but, with equal temperatures, quantity of heat is the measure of volume of light.

I have promised to refer to the question of enriching ordinary coal gas, but the case is so plain that he who runs may read. If, as I have stated, carburetted water gas of 18-candle power can be made in the London district at 2d. per 1000 cubic feet less than the cost of 15-candle coal gas (and, with the possible exception of a single Company, this is far short of the facts), it is not a question of "costly enrichment," but of displacing an expensive low-grade gas by a cheap high candle-power gas of equal calorific power. Such substitution will effect the largest possible net saving per unit of heat (and light); will utilize to the utmost extent present holders, mains, and distributing system (which must be proportionately enlarged for a weaker gas); will extend whatever usefulness may attach to flame-luminosity; and will realize all the collateral advantages of carburetted water gas manufacture (against the necessity of maintaining an absolutely fixed percentage of "blue" gas).

Under these circumstances, companies who are frittering away standard prices in exchange for small reductions in illuminating standards, are assuming grave responsibilities towards those who have invested in their undertakings on the security of their contracts with Parliament.

I cannot hope, within the limits of this communication, to drive my points home. Assuming that all are seeking the truth, I have endeavoured to illumine the general path by the means at my disposal. I do not aspire to assist the blind.

THE QUALIFICATIONS OF A SUCCESSFUL GAS ENGINEER.

By J. Wentworth.

In the discussions and articles that are now going the round there seems to be a point in the education of a gas engineer that is being overlooked—viz., the practical business and commercial side. In fighting the electric light, it is not the highly scientific man who is coming out on top, but the practical business man, who is quick to grasp the situation and meet energy with energy. It is a trite saying that "dividends are made in the retort-house;" but, like other truisms, it is only partly true. It is no use to make a lot of good gas if you cannot get rid of it; and there are probably very few gas-works in this country that could not send out more gas if they could sell it. The gas man, instead of spending his time in worrying how to produce an extra 100 cubic feet per ton of coal (important as that may be), could more profitably employ it in trying to sell a few more millions per annum; the other would follow naturally when he had to look round as to how he was going to produce the increase. Then it is no use to sit down and cry out at competition, or wait till the electric light is installed and then say, "Oh! we can give you a better and cheaper light than that;" the better and cheaper light wants to be there first.

One cannot wonder that electric light has got ahead so much, to see the ugly lamps—many of them a long way out of upright—and the miserable light emitted; and if gas people are content to leave things as they are the public will not, and, independently of cost, will naturally go for the more handsome and brilliant light. There is no excuse now for these things, if gas men will be up and doing. They have undoubtedly a better thing to offer; but it must be offered, not wait to be solicited. The gas manager had far better spend his time trying to push his good thing by every available means—soliciting and advertising—than to bemoan his fate and grumble at the advance of his more enterprising rival. This is where the training of our engineers is at fault. Too much is made of scientific and technical training, and not enough of practical and commercial education. Not many years ago, a certain gas company were threatened with serious competition from the electric light. Who was selected to fight it? Not the man who could talk glibly of carbonic acid and sulphuretted hydrogen, but a man who probably had never been inside a gas-works in his life—an engineer though of unbounded practical common sense and of good social position. With what result? That company is in a far better position to-day than it probably would have been if a man had been sent imbued with the musty and cast-iron traditions of the gas industry.

A man to meet the present competition should have a much more varied and wide experience than can be gained in any gas-works, and should be competent to advise on the use of gas both for lighting, heating, and power, and not a producer only. How many men, for instance, could take a gas-engine apart, and explain all its complicated working? It should be part of a man's training to understand the working of all machinery, both inside and outside the works, connected with gas; and only a practical workshop experience can give this. "Never put a man to do what you cannot do yourself" is a maxim worth striving for. The boy now who is to be the future manager, usually hangs about his father's or some relative's works until

some place turns up where he has enough influence to get him in. Then one hears the remark: "He will be all right there, he has a good foreman." That is the rub. He often has to depend on his subordinates, and in the case of a breakdown is lost. Men are often put into positions of responsibility too young and without the necessary experience to grapple with passing difficulties. Then comes in the consulting engineer. If every man were competent for his post, where is the need of the consulting gentleman? The fact of so many practising as such proves the conclusion. What is required in the successful manager is unbounded practical common sense and commercial ability, plenty of push and energy, not one to sit down and await events, but up and doing, determined to make use of the advantage he has and to be first in the field—always remembering that once a system is installed, it takes a lot of ousting—keeping himself well up to date, and a bit before, in all the improvements likely to aid him in not only maintaining his position, but getting one ahead.

The trend of thought requisite to produce a highly scientific mind is not altogether the best training for such qualities. If a man has enough technical skill to enable him to make practical use of the discoveries scientists make, and the qualities in him already stated, he need not fear to take on the full responsibilities of management—knowing he is fully equipped to meet, and overcome, the difficulties he will be sure to encounter without outside aid, and also successfully compete with any rivals.

Gas Lighting on an Electric Railway.—The Berlin newspapers announce, as a novelty, an electric train lighted by gas. The defective lighting of the experimental train on the Wannsee line is responsible for this. There were complaints that the incandescent electric lamps in the carriages of the trial train became duller when the current was turned on at starting, or when the speed was increased. The management therefore returned to gas lighting, which was easily re-installed, inasmuch as the trial train on the Wannsee line was still furnished with the necessary fittings.

British Association of Water-Works Engineers.—We learn from the Secretary of the Association (Mr. Percy Griffith, M.Inst.C.E.) that the seventh annual general meeting of the members will be held at Leicester from July 22 to 25, under the presidency of Mr. Frederick Griffith, M.Inst.C.E., the Water Engineer to the Corporation. We have received the "Transactions" of the Association for the past year. The volume contains the papers read at the two meetings held (one of which, it may be remembered, was marred by the calamitous fire at the Birkenhead Town Hall), with the discussions thereon, edited by Mr. Griffith. The text is illustrated by a number of folding plates; and there is a useful subject-index to the whole of the papers contained in this and the preceding five volumes. The book is now bound in cloth—a distinct improvement.

The Calorimetry of Gases.—The ability to foresee events, and to profit by this prevision, is a characteristic of a good man of business; and it is evidently possessed by Mr. John F. Simmance, of the firm of Messrs. Alexander Wright and Co., Limited. He is impressed with the belief that future legislation in regard to the quality of gas will have the effect of bringing calorimetry into greater prominence than photometry, and therefore he has anticipated the demand for information on the former by preparing the little book on "Calorimetry of Producer and Illuminating Gases," the publication of which is announced in another part of the "JOURNAL." In the 30 pages of which it consists, the author does not deal in any way with the theoretical heat values of gases, but makes his work, as he says, "a practical guide for the experimentalist who desires to estimate, rapidly and accurately, their practical calorific effects in recognized units." Mr. Simmance is concise in his diction; and where he wishes to emphasize, he prints his text in black type. The book is neatly bound in cloth, and gilt lettered.

Coronation Illuminations.—In connection with the approaching Coronation rejoicings, no doubt gas managers are on the look-out for a cheap and portable method of illumination which will answer the requirements of consumers in private houses and the smaller business establishments. Some very effective transparencies which will meet the purpose are offered, at reasonable prices, by Messrs. Falk, Stadelmann, & Co., of Farringdon Road, E.C. These transparencies are hand-painted in oils on the best window holland, and can be had mounted or unmounted on wood frames. Any method of illumination can be employed at the back; but strong iron stands for gas, with two jets and flexible tube cock, can be had at a moderate price from the firm. Portraits of the King, the Queen, and the Prince and Princess of Wales, in different styles, are supplied, with or without mottoes; or mottoes alone, suitable for balconies and other long narrow situations, are to be had. Transparencies mounted on iron cases, with gas ways and jets ready for connecting to the supply, are among the superior type of decoration offered by the firm. ——Messrs. Ritchie and Co., of 46, Hatfield Street, Southwark, have forwarded to us a sheet of some excellent illumination devices which they are placing on the market. The designs are choice and artistic; some of them being very happy in their character—combining in single devices symbols of England, Scotland, and Ireland, as well as of the British dominions beyond the seas.

TECHNICAL RECORD.

THE USE OF OIL IN WATER GAS, COAL GAS, AND AIR GAS PRODUCTION.

The second of the series of lectures by Professor VIVIAN B. LEWES, at the Petroleum Institute, 26, Bevis Marks, E.C., was delivered on Monday last week. On this occasion, he gave a sketch of the history of water gas and air gas manufacture, and incorporated in it a large amount of information as to the important part that oil takes in the generation of these gases for illuminating purposes, and as to the relative values of the gases. The subject has not—taking it from the beginning to the end—been dealt with in such narrow compass before; and therefore we report the lecture practically in its entirety.

Dr. DVORKOVITZ, who occupied the chair, said that, as most of the audience were gentlemen who belonged to the oil industry, they would no doubt know the importance of this lecture to that industry. He would only mention one fact, and it was this, that many years ago, when he first had the opportunity of introducing Russian Solar oil in a carburetted water-gas plant constructed by Messrs. Humphreys and Glasgow, people never dreamed of the magnitude which the Solar oil trade would obtain in connection with the gas industry. Professor Lewes would tell them of the height that had been reached in the application of oil in gas making; and it would be seen that the supply of Solar oil to gas manufacturers was a matter of the greatest importance to the oil industry.

BEFORE THE DAYS OF CARBURETTED WATER GAS.

Professor LEWES said: A fortnight ago I introduced you to some of the methods employed in mineral oil-lamps, and showed you how in the lamp a portion of the energy derived from the combustion of the oil is utilized in converting the liquid oil into the mixture of gases which we call oil gas. To-night, I am brought to the next most important method for its use; it is probably the one next to the oil-lamp which employs the largest proportion of oil. The introduction of oil for the enrichment of coal gas only arose some twelve years ago. Up to about 1889, no gas manager had ever dreamed of utilizing anything but coal; and when his coal did not give him a sufficiently high candle power, then he went to richer coal, and utilized the different grades of cannel for enriching purposes. And you find, as a general rule, taking Durham sea-borne coal, and carbonizing it at temperatures in the gas retorts which give the most economical results—that is, the largest volume of the highest candle-power gas—that the economical result is generally reached when between 10,000 and 11,000 cubic feet of gas per ton of coal are obtained, with an illuminating power of from 14 to 15 candles. Inasmuch as the gas companies were labouring under the drawback of a grandmaternal Government, who had put in their Gas Acts a standard of 16 candles, the illuminating power obtained from the ordinary coal was not quite high enough; and they had to find some way by which the required candle power could be got. This was done by taking 3 per cent. of cannel coal for each candle power that they wanted to enrich the gas by, and that cannel was mixed with the coal before retorting it. There were two drawbacks to this. The first one, which touched the gas manager very deeply indeed, was that it was rather costly; and, in the second place, it rendered the coke very inferior. This rich bituminous coal gives a very large volume of very rich gas; but it leaves behind a coke which is little better than an ash. The result was that efforts were made to get away from these troubles; and the gas manager naturally looked round for other hydrocarbons to afford him relief. He was further goaded on by cannel leaping up in price. During 1887-9, there was such a rapid rise in cannel that the enrichment cost the gas manager something like 3d. per 1000 cubic feet per candle, to bring the gas up to the standard requirements.

THE EVOLUTION OF CARBURETTED WATER GAS BRIEFLY TOLD.

In 1889, an American named Van Steenberg came to England, took the Humphries Hall at Knightsbridge, and put up a plant for the manufacture of what he called "carburetted hydrogen." There had been the year before a great financial scandal over the Samson Fox flotation of water gas. But Van Steenberg was cute enough not to soil his gas by tacking the name of water gas on to it; and so in carburetted hydrogen he brought forward what was practically a new gas in London. In this process, he simply made water gas in a water-gas cupola; and in the upper part of the cupola he injected low-flash point oils on the top of the incandescent fuel. These oils were fully vaporized and decomposed into oil gas, and a gas of 22 to 24 candle power was obtained. The rapidity with which it was made attracted general attention; and most of the gas managers of London and the neighbourhood went to see this gas. Several of them were much impressed with it—impressed by the rapidity with which the gas was produced. This was the factor that weighed most with them, as well as the fact that only a small amount of labour was required. It will be remembered that just at that time there were signs of serious trouble in the labour market as affecting gas-works; and then anything which would make gas so as to give them a stand-by in foggy weather, and anything which employed a small amount of

labour, and so gave the gas managers a chance of fighting the labour troubles, appealed to their imagination. One of the results of this was that Mr. G. C. Trewby went over to America, in order to investigate the various processes of carburetted water-gas manufacture in vogue there. Already for several years in America they had had carburetted water gas almost ousting coal gas, and playing an important part indeed among the illuminants of that country. Mr. Trewby investigated the processes used there, and found that Van Steenberg's was not looked upon as by any means one of the best. It was a process which was accused of making a large amount of benzene, which always condensed in the mains, and gave rise to a good deal of trouble. But the process which was universally employed there was the Lowe. This is also practically the only one that has since been successful in England. Two types of the Lowe process are now on the market, and are universally used.

Before we go further into that question, I must say a few words as to the water gas itself. The water gas is the substance which has to carry the oil gas—the oil vapours—in order to allow them to develop their luminosity. Water gas is itself about a century-and-a-quarter old; it having been discovered in 1780. Certainly Cavendish by 1783 knew all about it. In those days, they passed steam through tubes containing carbon heated up to a bright red heat. If you take steam and pass it through incandescent carbon, a chemical decomposition takes place, and the hydrogen is set free. At high temperatures, carbon has a greater affinity for oxygen than hydrogen; and when steam and carbon in any of its amorphous forms, are heated to such a temperature, the steam is decomposed, with liberation of hydrogen and either carbon monoxide or dioxide—the oxide formed being to a great extent dependent upon temperature, and the quantities of steam and carbon interacting. Now, in decomposing water to the form of steam, you have an enormous absorption of heat taking place. In the early days of the discovery of water gas, and in the attempts to utilize it, this factor wrecked every process almost that was brought out. Early in the last century—about 1820—attempts were made to produce water gas in what was an exceedingly simple way. That was, to take the coal to the retort, and then, when there was a red-hot coke left behind in the retort, to blow steam through it, and so convert it in that way, while heat was being poured into the retort from the outside—the idea being to convert the coal entirely into gas. This idea has a great fascination for the theorist. It has been patented at least fifteen times since 1820, when it was first brought out. But every time it was attempted, the same set of factors brought it to a disastrous conclusion—that is, that so much heat is used up in the decomposition of the steam to form hydrogen and carbon monoxide, that the heat cannot be poured through the walls of the retort quick enough to keep up the heat of the retort. So that this process has for some time failed on that account. At first, while the fuel is at bright incandescence, water gas is made; but as the temperature at once begins to fall, instead of getting a mixture of hydrogen and carbon monoxide you get formed carbon dioxide, which is a gas that will not burn. Therefore in these earlier processes, this factor of insufficient temperature wrecked them.

It was not until the middle of last century that this trouble was being overcome. Then it was that the idea arose of making water gas by the alternating process. In that you simply took a fire-clay cupola, filled it half full with coke, ignited that coke, and then with an air blast blew it up to incandescence. During the blowing up of the fuel to incandescence by the air, producer gas was formed. You find, in this producer gas as made in these alternating machines, the oxygen of the air turning the carbon to carbon monoxide and carbon dioxide, while nitrogen and small amounts of other impurities formed the remainder of the gas. You had a gas about 30 per cent. of which was combustible. This used to be simply blown up through the chimney of the cupola, and allowed to escape when it had brought the fuel up to a sufficient temperature. Then the air blast was cut off, and steam was injected through the mass of red-hot carbon, and it was broken up into hydrogen and carbon monoxide; and then there was a gradual fall in temperature taking place. But for some four or five minutes you could go on blowing steam in with the fuel falling below the temperature at which hydrogen and carbon monoxide were produced. Then the steam had to be cut off again, the stack-pipe opened, and the air blown through until the needful incandescence was once more obtained.

Although there was a loss of fuel in making this producer gas, still there you had the practical possibility of turning out the water gas in large quantities. This alternating method of first blowing up the fuel to an ever-increasing temperature until the desired incandescence was obtained, and then steaming it down in making the water gas, went from France, where it was first introduced, over to America; and the American engineers devoted a large amount of attention and ingenuity to its perfection. Just about 1883, it came back again to Europe in a perfected condition. In Germany, it was at once taken up; and many firms used it as a gaseous fuel. It was gaseous fuel of great value where intense local heat was wanted.

While it was slowly finding its way back into Europe, the Americans were making still further development by taking this non-luminous water gas and endowing it with luminosity by mixing it with oil gas. Now, in order to make the oil gas, it had to be heated up to a temperature at which it decomposed, and gave nothing but gaseous products. When they first started to do this, they tried various retort processes. Processes were introduced in which the water gas was made, and then passed through retorts where the oil was being decomposed, and the oil vapour was swept along by the current of water gas. But it was found that this was not an economical method of doing it. There was a great waste of heat owing to the escape of the producer gas formed while blowing the fuel up to incandescence; but still that was the basis of all successful processes. Lowe finally introduced the method of making water gas in cupola furnaces in the way it is made to-day. He made water gas in fire-clay lined cupola furnaces; and by a blower he raised the fuel to bright incandescence. Instead of blowing off the producer gas, he led it away into large chambers, which he filled with brick chequer-work, in which the producer gas—that 30 per cent. of inflammable matter—was burned with a small subsidiary air-blast. They burned together with a big, loose flame, and heated the chequer-work to a dull redness. By the time the cupola was blown up to the required temperature, the chequer brick work was heated up to the necessary temperature to break up the oil. The oil was introduced, and allowed to go gently down, and then the rush of water gas carried it through the enormous mass of heated material. First you had the oil in the upper part of the chamber merely vaporizing, and then it got to a great extent gasified, and then, passing it through more and more of the heated brickwork, it got converted into a thoroughly permanent gas.

Now this form of apparatus had one great advantage over all other forms in the enormous area of the heated material which was used to decompose the oil. Dr. Dvorkovitz could tell of the wonderful variations which can be obtained in the decomposition of the oil—the way in which variations of temperature will bring about a totally different set of interactions in those wonderful analytic and synthetic changes where you have the oil being decomposed. Whereas in one set of interactions you are making products that are rich in aromatic hydrocarbons, you can, by altering the temperatures, get bodies of a totally different character. In most of the water-gas plants which had been used, you had a much smaller generator heated to a much higher temperature; and the trouble with them always was that you could not get a sufficient nicety of regulation in the cracking of the oil to anything approaching rich results; and there was always trouble arising from deposition of carbon. The Springer apparatus was one which had a short life; and the trouble with it was that the superheater space was not large enough to allow of a sufficiently slow cracking of the hydrocarbons of the oil—it had a high temperature for a comparatively small space.

The Actual Carbon Monoxide Content.

Though modifications of the Lowe apparatus have been brought out, and though it has been on the market now for a considerable period, there has been nothing for making carburetted water gas—the mixture of water gas and oil gas—that has in any way imperilled its position as the leading apparatus of this character. As I have said, the great importance of the carburetted water-gas apparatus to the gas maker is to be found in the enormous rapidity with which he can turn out a large volume of gas in case of emergency, and moreover the small amount of labour it is necessary to employ upon it. And as you have had the oils being brought down to reasonable limits of price, you find that the popularity of the carburetted water-gas apparatus with the gas manager is steadily increasing. But with the public there has always been one bogey, and it is always brought forward whenever the gas manager has desired to increase his ordinary coal gas supply with carburetted water gas—that is, the carbon monoxide which it contains. If you take ordinary water gas, it contains about 40 per cent. of carbon monoxide; while carburetted water gas contains on an average something like 30 per cent. This reduction in the quantity found is merely due to the dilution of the water gas with the oil gas. Now if there is a one-hundredth per cent. of carbon monoxide in the air of your room, within five minutes you will get a severe frontal headache; and if you keep long enough in the atmosphere, you will find still more disagreeable symptoms. But if you go into an atmosphere which contains over $\frac{1}{2}$ per cent. of it, you simply go down as if you had been pole-axed. I have myself been gassed on one or two occasions, and the "sensations" are not very serious. When there is gassing of this kind, all you have to do is to simply treat the man as if he had been drowned. The carbon monoxide gas is a poisoner by entering into combination with the oxygen-bearing constituents of the blood; and, by forming these into compounds which are again very difficult to decompose, it practically stops the action of the blood in the body. If, however, you induce artificial respiration for a little time, you find that gradually the oxygen of the air begins to decompose this compound. If the man has not got too far, he can be brought round in a quarter of an hour, and all ill-effects will pass away in the course of the day.

But the fact that there was this terribly poisonous gas present in the carburetted water gas was enough to start a great outcry against its introduction. Water gas was not opposed in London, because no one had the vaguest idea it was being used, and it had been used for a good many years before the fact dawned upon anybody. So that, by that time, there was ample evidence to show it was not more dangerous than coal gas. But where the public knew it was going to be introduced—as in Liverpool and Birkenhead—there was at once a great outcry against the carbon monoxide. My private opinion is that you should not have in any of the gas sent out for public

consumption, more than about 16 per cent. of this carbon monoxide; and consumers of gas north of the Thames are using a mixture of coal and water gas, in which this percentage is never reached, much less exceeded. About one-third of the gas supplied north of the Thames consists of carburetted water gas. This gas is employed mixed with the coal gas, in order to partly increase its volume and partly to bring it up to the required 16 candles of illuminating power, because the illuminating power which you get from the carburetted water gas is purely and simply dependent on the amount of oil put in. You can make anything you like from 16 up to 30 candle gas with equal ease. What the Company north of the Thames do is this: They make ordinary gas of 14 to 15 candle power from Durham coal; and they add something like 20 to 25 per cent. of carburetted water gas of about 24-candle power; and this addition of one-third or one-fourth of 24-candle carburetted water gas brings the 14 to 15 candle coal gas up to the necessary point to enable them to send it out of Beckton with an illuminating power of about 17 candles.

But skin friction in the big mains, and more so in the smaller mains, fall of temperature, and other factors, bring the 17-candle power down to just above 16 candles, by the time the gas reaches the testing-stations spread over the whole of London. The result is that the percentage of carbon monoxide is never brought up to a point above 12 per cent. I analyze the London gas occasionally, in order to see what is the percentage of the carbon monoxide; and I have never found it above 12 per cent. It generally runs at about 7 per cent.; and very rarely it reaches 12 per cent., and then only in case of foggy weather when there is a great demand for gas, and the gas maker uses his carburetted water-gas plant to a greater extent to meet the extra demand. Twelve per cent. of carbon monoxide is absolutely non-deleterious. When I say this, I mean that there is no more danger with that amount of carbon monoxide than there is with ordinary coal gas. Indeed, in some places where pure coal gas is distributed, and where the public would simply go mad if they had water gas being sent out, it is found that there is 12 per cent. of carbon monoxide in the gas owing to a coal rich in oxygen being used. Carburetted water gas has quite as strong and distinctive an odour as coal gas; and any leakage would be quite as easily detected; and the experience of many years here and in the United States has not shown any higher percentage of fatal accidents from its use than when ordinary coal gas is employed.

The Oil Industry and Carburetted Water Gas.

Now you find the carburetted water-gas plant has been of very great benefit to the oil industry; and in any big industry like this you must have as many levelling factors as you can practically get. You have got a crude petroleum substance which, when you come to distil it, gives myriads of distillates, all of them having different specific gravities and flash-points, and fitted for different functions; and if there is an entire demand for only one sort of distillate, you must recognize how fatal that is to the trade—you have enormous quantities of waste material which must be got rid of somehow. Now you have a large and growing demand for your petroleum spirits and light oils. You have the lamp trade looking after the whole of those grades; and the very fact that the best grades of oil for making carburetted water gas are those grades of distillate which cannot be used for lighting, makes the carburetted water-gas plant of great importance, because it provides an outlet for what has been before almost a waste product. Oil lamps are restricted to oils having a flash-point above 73° Fahr., and yet of a sufficiently low specific gravity to flow freely through the wick; and the oils which can be used for making carburetted water gas come in between the oil best fitted for lamp use and the oils of far higher specific gravity that you want for lubricants. The light oils, moreover—the so-called petroleum spirit—which are the lightest distillates from your oil, they have also had, during the last ten years, a very important part to play in connection with coal gas. The same factors which led to the introduction of carburetted water gas also led to the introduction of light petroleum spirit as an enricher of coal gas—merely by charging the coal gas with the vapours. If the poor coal gas is passed over the petroleum spirit, the coal gas at once takes up a proportion of the vapour, and you have considerable enrichment of the gas.

The Price and Value of Carburetted Water Gas.

But before we go on to discuss that point, I had better say a few words more regarding the price of light obtained from oil when used in carburetted water-gas apparatus. Now the oil fluctuates somewhat in its price; and so it is not easy to give an estimate of the cost of carburetted water gas which will be acceptable to everybody. I think, however, a fair estimate of the price may be arrived at on the following basis: At the present time, oil such as is fitted for making carburetted water gas is fairly cheap; and an oil can be purchased for this purpose at from 2¼d. to 2⅜d. a gallon, and for most of the big works around London 2¼d. may be taken as the price. We will take first of all carburetted water gas which shall have the same illuminating power as our ordinary coal-gas supply—that is to say, 16-candle water gas. For this, 2¼ gallons of oil would be required; and we will take the price of the oil at 2¼d. So that the price of the oil used for making 1000 cubic feet of carburetted water gas is (say) 5·06d. The fuel would consist of 40 lbs. of good coke, which would cost, at the rate of 15s. per chaldron, 3·20d. The fuel used for raising the steam would be about 15 lbs. of breeze, which (as it would not run to more than 3s. 6d.), we will take as costing 0·28d. Then purification may be taken at 1d., working on a large scale. Labour may be taken at another 1d.; and wear and tear of plant at 1d., because there is a considerable amount of wear and tear in these generators. Supervision comes out at 0·7d., and water and stores at 0·25d. Now these are working figures, taken over a long period of absolute practice; and they come out at 12·49d. per 1000 cubic feet of 16-candle carburetted water gas. The advocates also tell you that there should be a deduction from this. There is the value of the oil tar, which is fairly high on account of the benzene it contains; and the value of the tar obtained per 1000 cubic feet of gas would be 0·36d., so this would bring the total cost down to 12·13d. per 1000 cubic feet for 16-candle gas, and at a cost of 1¾d. more for oil (or close upon 14d. in all) you can get up to 22-candle power gas.

Now when contrasting the cost of illumination by carburetted water gas with that yielded by oil gas, it is useless to take the cost of production; for this reason, that we speak of London gas costing (say) 3s. or 3s. 6d. per 1000 cubic feet. This means that the gas is delivered into your house at that price; while the cost of 16-candle coal gas in the holder, is probably about 1s. to 1s. 2d. per 1000 cubic feet. The difference between the two prices is made up of charges on capital, cost of distribution, profit and other factors. If you had a town supply of carburetted water gas under the same conditions as a town supply of coal gas, the 12·49d. in the holder for 16-candle gas would be about equivalent to the coal gas you are at present getting on this side of the Thames. Therefore, it may be taken that the amount of light obtainable from oil as an illuminant, when utilized as carburetted water gas, per unit of cost, is practically the same as ordinary 16-candle coal gas at 3s. per 1000 cubic feet—that is, when used in the flat-flame, argand, or regenerative burners. In the incandescent mantle (which is playing such an important part in illumination at the present day), it is not quite so good—at any rate its detractors say it is not. The reason for this is that, if you take a 16-candle gas made from Durham coal you have a value of about 640 British thermal units; while, on the other hand, a 16-candle carburetted water gas only gives about 520 British thermal units. But in the incandescent mantle, the gas, whatever it may be, is burned with a certain supply of air; and where you have got a gas of lower thermal value, it only means that you have not got quite so much material to burn up. If the air supply is regulated, you find, as the air supply is reduced owing to the slightly poorer gas, you have not so much inert nitrogen of the air to heat up and to carry away the heat of the flame; so that, as far as the photometrical results go, the same satisfactory results are obtained. From a theoretical point of view, it is interesting to note the candle units per gallon of oil obtainable by gasification under the conditions existing in carburetted water-gas plant; and a fair average over all the water-gas practice is 1450 candle units.

Air Gas.

Petroleum spirit was introduced as an enricher of coal gas about the time that carburetted water gas came to the assistance of the coal-gas industry was introduced; and, about the same time, what is known as air gas. This was made by passing air through or over oil having a flash-point of below 73° Fahr., and in its passage the air took up from it a certain amount of vapour. This made a gas which would burn in an argand or flat-flame burner, and gave a fair illuminating power. As soon as various grades of oil began to come into the market at a reasonable price—about 1860—then air gas commenced to make its appearance; and the number of patents for it in its various forms is simply bewildering. In America, they have invented a new phrase in order to cover this particular type of gas; and it is now always referred to under the generic name of "greased air." (Laughter.) This greased air, which is atmospheric air laden with the vapours of easily volatilized hydrocarbons, plays an important part as an illuminant; and it has played a still more important part in the *repertoire* of the inventor looking about the City and elsewhere to raise capital. There was something irresistible to the capitalist or company promoter in seeing a man come in with a small box or cylinder, and, by simply passing air through it, produce a fairly effective illumination. The number of semi-flotations there have been for various air-gas processes are numerous in number; but few of them have been a commercial success. The reason for this is that if you pass air over petroleum spirit, so as to charge it with the vapour, you find that it has no satisfactory effect in developing light from the petroleum spirit; and the result obtained has always been a poor one. Although the flame looks a fair one, when you come to test its photometrical value you find it is not really high. At the best, air gas is a poor illuminant when burnt under ordinary conditions in flat flame or argand burners, and, even with a petroleum spirit of uniform composition, and a specific gravity of ·679, obtained at the cheap rate of 8d. a gallon, it is only possible to obtain about 50 candles per hour for 1d.; so that its economic value is a little less than can be got from 16-candle coal gas at 3s. per 1000 cubic feet, when used in a flat-flame burner.

Still, the various forms of apparatus in which the air gas was made were applicable to country houses; and if the gas could only have kept up its performance, it would have had a great future indeed. The thing which really wrecked it was this: In the earlier days, they had petroleum spirit, which was a mixture of numerous different bodies of different boiling-points and very different powers of evaporation. They mainly used a big carburettor, in

which was the petroleum spirit, over or through which the air passed. At first the flame was a fairly satisfactory one. The air gas which was made first took off all the volatile portions of the hydrocarbons, and left behind portions which became heavier and heavier in specific gravity. There was consequently an enormous falling off, as the oil in the carburettor got more and more condensed—as this slow fractional distillation proceeded to a greater and greater extent. So that, although you might be getting 22-candle power air gas at the beginning of an hour, two hours afterwards you might have dropped down to 7 candles. This want of uniformity was practically fatal to it. In 1863-65 Dr. Letheby, who was then the Chief Gas Examiner to the Corporation, conducted numerous experiments in order to ascertain whether he could make this air gas a practical process on a large scale, because he wanted to use it in outlying districts where coal gas was not obtainable. But it never could be done, simply for the reason that you could not, at a reasonable price, get a sufficiently uniform article. As will be shown, however, in the next lecture, it is not unlikely that, aided by incandescent mantles and greater uniformity in the liquid hydrocarbons used in carburettors, this form of illuminant may still have a bright future.

Oil Enrichment of Coal Gas.

This air gas, however, acted in another way. It gave rise to the idea of utilizing these very light vapours for giving light to other carrying bodies besides air; and when cannel got dearer and dearer, petroleum spirit was tried as an enricher of poor coal gas. There is no doubt that, using a volatile hydrocarbon of definite composition—such as pentane or benzol—it is quite possible to enrich gas to a very great extent, while if the gas takes up the hydrocarbon vapour at a temperature below that which it will afterwards encounter, there is no fear of it again depositing. But with compounds like commercial gasoline, which is a mixture of many hydrocarbons, the more volatile portions will be taken up first, and the liquid will gradually lose its enriching power; and in the case of hydrocarbons vaporized by heat, only a small quantity of vapour must be employed, as otherwise it will be afterwards condensed in the pipes.

It must be clearly borne in mind that the evaporation of a hydrocarbon vapour into a gas is not dependent upon its specific gravity or boiling-point, but is purely a question of vapour tension. Most liquids when left to themselves in contact with the atmosphere or with other gases, gradually vaporize and disappear, and those which evaporate the quickest are said to be the most volatile. Ether, when dropped on exposed surfaces, at once vaporizes, causing, by its evaporation, considerable cold; and the same is the case with the lightest forms of naphtha. Besides liquids, some solids possess this property of evaporation—such as camphor, naphthalene, and iodine; and it must also be remembered that evaporation occurs over a very wide range of temperature, although there is for each substance a limit below which evaporation does not seem to take place. So it will be seen that the most important point to remember in choosing a liquid for carburetting in this way is that the vapour tension is a greater factor to be considered than specific gravity or boiling-point.

The term "carrying power" has become a very common one with some people, who look upon a gas as being a good or bad "carrier" of certain vapours. But this is a mistake, as a volatile liquid will evaporate into all gases at the same rate, and practically without reference to the properties of the gas. The idea that the quantity of vapour taken up varies with the properties of the gas is due to the wide divergence in the illuminating power obtained from the carburetted gas. All the old carburetting systems had one great trouble to contend with—viz., that the samples of commercial naphthas are mixtures of various hydrocarbons, having each its own boiling-point and vapour tension; so that, when used for carburetting, they yield up their more volatile constituents at first very freely, but after a time the amount rapidly diminishes as the boiling-point of the residue becomes higher. Consequently when (in an experiment) 2113 cubic feet of poor coal gas were passed through a naphtha having a specific gravity of ·869 and a boiling-point of 103° C., the temperature during the experiment being 22° C. or 72° Fahr., the first 80 cubic feet of gas took up 23·2 grains of naphtha, while the last 450 cubic feet only took up 7·5 grains. Increase of evaporation with rise of temperature is another drawback, as, with an ordinary carburettor exposed to atmospheric influences, the enrichment of the gas, which reaches 54·4 per cent. in summer with an average temperature of 22° C., falls to only 22 per cent. in winter with an average temperature of 3° C., or 37° Fahr. The form of apparatus has a great influence on the result obtained with the old carburettors. For instance, when the gas passes through a box containing a layer of naphtha, only about 3·2 grains are taken up, while in a carburettor in which some of the same naphtha is sucked up by cotton fibre, as much as 22 to 25 grains are absorbed in the same period of time.

Latterly the idea of carburetting coal gas in bulk has been revived by an apparatus contrived by Messrs. Maxim and Clark, which obviates the difficulties met with in the old forms of carburettor. We have seen that, when carburetting a gas with gasoline or light naphthas, the more volatile portions are first absorbed by the gas; and as the process is continued, less and less is taken up. This would be a difficulty in carburetting gas in bulk, as the various layers of gas would only slowly mix in the holder by diffusion, resulting in gas of uneven illuminating power. But the Maxim-Clark apparatus is so arranged as to supply each portion of the gas passing through it with its own particular share of hydrocarbon, and does not allow the selective absorption of the more volatile portions by the first samples of the gas. The carburettor can be used either before the inlet or the outlet of the holder. And where, owing to troubles in working, there has been a sudden fall in illuminating power, this process has been found to be an enormous boon. The hydrocarbon liquid originally used in the Maxim-Clark carburettor was American petroleum spirit, having a specific gravity of ·680; but of late Borneo and other Eastern spirit of higher specific gravity (·700 to ·710) has been used, and it was quite as good for the general purposes of the carburettor. These spirits are delivered into the tanks at the gas-works for about 8d. per gallon. A gallon of the "carburine," as the petroleum spirit is generally called, can bring up the illuminating power of 8000 cubic feet of coal gas 1 candle above its initial value, or, as the candle power is calculated on a basis of 5 cubic feet consumption per hour, it means that for 1d. you can, from this vapour, utilized in this way, get about 200 candles. You see at once an important point brought out here: When you are using air gas—that is petroleum spirit carried by air—you get 50 candles for 1d. When you are using the same petroleum spirit carried by coal gas 200 candles is the quantity of light obtained for 1d. The ease with which this method of enrichment can be applied to the gas as it leaves the holder for distribution, and the solvent action which the naphtha vapour has upon naphthalene deposits, make it a very valuable and popular aid to the gas manager.

Dr. Dvorkovitz, in thanking Professor Lewes, said the lecture had forcibly brought out that the oil industry must not look upon the gas industry as competitors, but as friends and consumers. In this country they had water-gas plant of a capacity approximately of 120 million cubic feet per day; and as between 2 and 3 gallons of oil were required per 1000 cubic feet of gas, it would be seen what an enormous field the oil industry had in carburetted water gas. The gas companies did not use their water-gas plant to its full extent; but with the reduction in the price of oil, owing to the opening up of new oil-fields, gas makers would be induced to use their apparatus to the full, or to a larger, extent. As Professor Lewes had shown them, the chief item in the cost was represented by the oil. Out of 12d., 5d. represented the cost of the oil, even at the reduced price of 2¼d. When they remembered that eighteen months ago, Solar oil was sold at 4d. per gallon, it would be readily understood that gas makers had not been able to use their water-gas apparatus to the full extent, nor had they been building more plant as probably they otherwise would have done.

NEW ENGLAND GAS ENGINEERS' ASSOCIATION.

(*Continued from p. 766.*)

Mr. C. S. Griswold, of Meriden (Conn.), read a paper on "House-Piping." The introduction of a gas-stove with one light over or near it led to inquiries as to the cost of piping houses throughout; and after consultation with local gasfitters, he established a schedule of prices for covered or exposed pipe, fixtures, and globes. Four rooms could be fitted for £2 6s. or £3 2s. 6d. (according to the style of fittings, &c.), and extra rooms at 8s. 4d. each. They would also supply pipe only, without fixtures, if required. The fixtures were made to order by a local firm; and they supplied only two patterns. At first, the work was done by local fitters at 12s. 6d. per opening; and in 1899, 128 houses were thus fitted. But the local fitters were dissatisfied, and the work was taken up by the Company's men. It was found that the consumers as a rule welcomed the change; and in 1900, 142 houses were piped, although the price was raised to £2 13s. and £3 15s. respectively. In 1901, the number of houses piped was 109. Only the best black pipe was used, and galvanized fittings; and the fitters were taught to think and work quickly. As a rule, too much pipe and too many fittings were used by the workmen. He found it a good plan to use T-pieces instead of elbows at angles, as affording facility for future extensions and for cleaning the pipes. Services (unless very short), stove supplies, and risers were not laid in less than ¾ inch pipe, and ⅜ inch was only used for branches with one opening. Galvanized fittings were preferred to black as less liable to contain sand holes. The fitters must be courteous, quick, and neat in their work, capable of planning and arranging the pipes with as few angles and as little cutting about as possible. Some houses were more difficult to pipe than others; and where there were double floors, or floors packed with cement, the charge was 12s. 6d. extra. When the work was sublet, there was a loss to the Company of 25s. per house; but after they carried on the work themselves, the loss was practically *nil*. There was no question with the local plumbers, who did not think there was much profit in this class of work; and apart from this, his Company did not lay themselves out for general fitting, so no conflict arose. This season he was going to introduce a three years' purchase system. He would fix a stove and three lights at an average cost of £3 2s. 6d., and set the slot meter so far in advance as would secure a return of the sum in three years, at the end of which time the whole would belong to the consumer.

Discussion being invited, Mr. J. A. Coffin said he had piped houses for twenty years, and had practically carried on the work at cost price. The three years' purchase system would

undoubtedly reach business that could not be obtained by other methods. The Massachusetts Commissioners would not allow galvanized fittings to be used, as they considered that faulty pieces could be galvanized in such a way as to fill up the defects and pass muster. Mr. Anderson liked the idea of using T-pieces in place of elbows. Mr. F. W. Humphreys said that at New Haven he came to an understanding with the local plumbers by whom houses were piped without loss to his Company. The plumbers fitted four rooms for £2 1s. 8d. The Company's charge was £3 2s. 6d., and 8s. 4d. per room extra; and the differences paid the cost of the fittings. In all, 230 houses were so fitted, and payment was made in three monthly instalments. He started rather slowly, so as to feel his way; but this season he would do double the business. He had decided in future to charge 10s. 6d. per opening and the cost of the fixtures in addition, so as to leave the customer perfect liberty as to choice. Last year the canvassers did not devote full time to the house piping; but this year they would give it more attention. Mr. Nute was in the fortunate position that the local plumbers would take work cheaper than he could do it himself, and pay his canvassers a commission. They were piping more than 1000 tenements per annum, and would take four or five outlets at 8s. 4d. per outlet and a larger number at some reduction, subject to his regulations and inspection. This did not include fixtures. Mr. Addicks said that the licensing of gasfitters in Boston had proved satisfactory to the Gas Company and to the consumers. The Company, however, still kept their own inspectors, and examined the work just as was done before. Some of the rules established by the Commission were objectionable. For one thing, they insisted on unnecessarily heavy pipe. Perhaps they had heard of Mr. Shelton and his high pressure. Then they provided that the pipes under floors should be encased in tar. This was necessitated by the common practice of laying floors in breeze concrete, in which material ashes and other refuse were freely used. The objection to this plan was that a short-circuit of electricity would generate explosive gas from the tar. On the whole, however, he was in favour of the licensing system. There was a provision in the law exempting the Company's men from license; but he made it a rule that his first-grade fitters should carry a fitter's licence. The law also provided that no meter should be moved or altered except by the employes of the Company, which was an excellent provision. The Commission had ordered the fixing of a straight-way valve, and not stopcocks, on the inlet and outlet of every meter. He considered the second valve useless, but was not fully prepared either to oppose or advocate the valve in place of the stopcock. Some accidents had occurred while repairing valves; and to obviate these, he had designed a safety cover. He would not like the Association to commit itself to a definite opinion that $\frac{3}{8}$-inch pipe could not under any circumstances be used for a stove, because in modern buildings, with their expanded metal partitions, the size of the pipe was a great consideration.

The President read the building laws of the City of Boston as referred to by Mr. Addicks. These specified three brass straight-way valves on every service—one just outside the building and two at the meter. Iron valves and galvanized fittings were prohibited; and a schedule of sizes of pipes was included. The President compared the latter with the pipe schedule issued by the Hartford Gas Company. Mr. Harbison said that at Hartford the Gas Company did not do fittings, as it was taken care of by the Fitters' Union. No man was admitted as a member of the Union unless he passed an examination; and the Gas Company had the right to inspect all gasfitting, both in respect to size of pipe and quality of work. Having found great difficulty on account of the small pipes used on consumers' premises, which was really due to the largely increased use of gas following repeated reductions in price, he issued a set of regulations in 1900, sending a copy to every gas-fitter's house. For years he had not laid a smaller service than $1\frac{1}{4}$ inch, or bought a smaller size of pipe for the purpose; and he had taken up miles and miles of 3-inch cast-iron pipe laid fifty years ago, and used all of it for services. Heating stoves were so generally used that, if $\frac{3}{8}$-inch pipes were employed to any extent, trouble was sure to arise; and this difficulty would be felt wherever gas was cheap. His experience was in advance of others perhaps, because his price was so much below the average. Another difficulty was that while the Gas Company could control new work, it was quite possible for a consumer to employ a gasfitter to carry out extensions without their knowledge; and in this way inferior work might get into use, to the detriment of gas and, perhaps, to the risk of the consumer. He agreed that a second valve at the meter was quite unnecessary, also with the use of T-pieces instead of elbows. He used galvanized pipe only for services, and believed its durable qualities more than covered the slight increase of cost. He did not think the condition of things indicated by Mr. Addicks existed outside Boston, and advocated ample sized pipes for the reasons stated, as he believed in a good, liberal supply. He did not object to tap a $1\frac{1}{4}$-inch hole in a 3-inch main; a $1\frac{1}{2}$-inch hole in a 4-inch main, and a 2-inch hole in a 6-inch main. Mr. Anderson remarked that the Boston regulations led to trouble, as, with so many valves, there was a good deal of injury, from accidental or mischievous causes, leading to leakage, for which the Gas Company were blamed. Mr. Coffin remarked that Mr. Harbison's experience was contrary to the general rule. It was usually found that $\frac{3}{4}$-inch was the limit for 3-inch mains, and 1 inch for 4-inch mains, and that the tapping of larger holes greatly weakened the pipes. Within the last few years, he had ventured to exceed this rule, and with unfortunate results, as there was great liability to fracture at the weakened part in frosty weather.

Colonel Richardson read a paper entitled "What is a Gas Company?" At the outset, he expressed the opinion that in towns of under 100,000 inhabitants at least the gas and electric supply should belong to one company under State supervision. A gas company was one of the largest of taxpayers, and also, or ought to be, one of the best customers of local merchants. He advocated buying as much as possible of home people, even at a trifle more cost. The gas company was a safe investment and source of income for individuals, families, or trustees of estate; and the chief portion of the earnings was expended in the district. It was a desirable client for bankers, as whoever heard of a money loss from a properly conducted gas company? Artificial lighting companies, honestly and competently managed under efficient regulations, were among the best of gilt-edged securities. A well-conducted street lighting system was a public boon, greatly aiding the police and the maintenance of law and order; and as regarded private supply, an immense amount of daily comfort and convenience was represented. The efficient management of a lighting company was no mere holiday pastime. It afforded an opportunity for the development of sterling worth in young men; and every opening to positions of honour and influence was a blessing in any community. It also gave room for the management of the business by honest progressive men in such a way as to avoid suspicion, and to gain the confidence and goodwill of the public. The plant should in all departments be kept in a high degree of modern efficiency; the offices clean, commodious, and well lighted, the staff neat, courteous, attentive, and truthful; and the whole service at the lowest prices commensurate with proper operation, good dividends, and safe contingency funds. Under such circumstances, business would flourish, and the public would meet the Company heartily more than half way.

(To be continued.)

THE CHEMISTRY OF THORIUM.

In view of the interest aroused by certain recent litigation on the patent rights in respect of mantles for incandescent lighting, the following summary of a paper published in the "Zeitschrift für angewandte Chemie" last year by Dr. G. P. Drossbach deserves attention. It has already been very briefly noticed in the "JOURNAL" (*ante*, p. 149).

The salts of the so-called rare earths are now important articles of commerce, and analysts should be prepared to determine their value. The methods of evaluation employed so far, however, have been almost exclusively based on reactions described by Bunsen. These are specially adapted for dealing with products rich in thorium; practicable methods for the analysis of monazite, for instance, have not been published. The different samples of commercial thorium nitrate have very different practical values, though all certified as proved by analysis. The illuminating power of mantles, made from them under similar conditions, varies from $52\frac{1}{2}$ to 105 candles, at 14-10ths pressure and a consumption of 4·06 cubic feet of gas per hour. Two samples of commercial nitrate, distinguished by very different illuminating power, when analyzed by the usual methods of Hintze, Weber, and Fresenius, gave the following results in parts per cent.:—

Mantles give	No. 1. A Bad Light.	No. 2. A Good Light.
Residue on incandescence	48·390	48·320
Ferric oxide	0·007	—
Cerium oxide	0·013	0·014
Yttria	0·002	0·002
Lanthanum and didymium oxides	0·014	0·020
Lime	0·080	0·170
Magnesia	0·011	0·049
Potash and soda	0·012	0·012
Phosphoric acid	0·007	—
Nitrous acid	3·800	1·900
Nitric acid	34·760	35·410
Thorium oxide	48·020	47·820

Evidently, therefore, the attempt to convert one nitrate into the other by making up the differences shown by analysis must fail; and the only correct means of valuing thorium nitrate would appear to consist in the manufacture of mantles from it by a practised hand. The life of the mantles is also of great importance. In order, however, to try to avoid the tedious testing of the light afforded, the author observed the influence of intentional admixtures on a sample of nitrate which gave a perfectly good lighting effect. Briefly, he found that admixtures of all kinds, in the small amounts which might occur in a commercial sample, are without influence; but in larger amounts—say 0·1 to 0·5 per cent.—they begin to have a marked effect. It therefore was plain that impurities, such as those indicated in the analyses quoted above, could not be responsible for the great difference observed between the two samples of nitrate—*i.e.*, that the light emitted was either 52·5 or 105 candles.

The reactions by which thorium is identified are these: It is

precipitated as oxalate by free oxalic acid, even from an acid solution; its hydrate and oxalate are soluble in alkali carbonates; its oxalate is soluble in alkali oxalates and acetates; its potassium double sulphate is insoluble in solution of potassium sulphate; it is precipitated by hyposulphites in the heat, and as basic acetate; and it gives no absorption or emission spectrum. These reactions distinguish thorium from all other elements. But Crookes found that yttrium was precipitated in the presence of thorium salts by thiosulphates. Professor Muthmann showed that commercial thorium nitrate may contain gadolinium, which, in the small proportion of 0·3 per cent., has the effect of depressing the lighting power by about 30 per cent. It may reasonably be conjectured that other members of the yttrium group, of which yttrium, ytterbium, erbium, samarium, and gadolinium always appear to be present in monazite, behave similarly. The author experimented with the mixture of the oxides of these elements obtained from monazite, and found that their optically colourless constituents cling tenaciously to thorium, and accompany it more or less readily through all reactions. They are only removed with difficulty from the mixture of oxalates by boiling with hydrochloric acid; and they are likewise not insoluble in ammonium oxalate in the presence of large quantities of thorium.

A solution of thorium nitrate containing 20 per cent. of the nitrates of the aforesaid elements was precipitated, while hot, with sodium thiosulphate, and the elements of the yttrium group were separated from the filtrate by ammonia. The precipitation was repeated four times; but nevertheless 2 per cent. of the oxides of the elements of the yttrium group remained with the thorium. Now 1 per cent. of these oxides greatly depresses the lighting power; hence they might well account for the low quality of a sample of thorium nitrate. Experiment proved that these elements could be more readily separated from the thorium by fractional precipitation. If the general solution is precipitated with 80 per cent. of the equivalent quantity of sodium hyposulphite, calculated on the acid present, the filtrate precipitated with ammonia, the precipitate dissolved in hydrochloric acid, and the sulphurous acid solution precipitated again with thiosulphate, no yttrium is precipitated the first time; but about 5 per cent., relative to the thorium, is precipitated the second time. A convenient method of separating strongly basic oxides from thorium is to precipitate the solution of nitrates with fixed alkali, using methyl orange as an indicator. Thorium is completely precipitated.

The No. 1 nitrate, treated thus, yielded distinct quantities of strongly basic oxides in the filtrate. These proved very considerable when the second fraction was subjected to the same process by sodium hyposulphite. The nitrate thus purified was washed, when transformed to oxalate, with strong hydrochloric acid, and converted into hydrate by means of excess of ammonia. This operation takes place most readily if the oxalate is dissolved in as little ammonium carbonate as possible, and is precipitated, while hot, with ammonia. The hydrate then comes down and can be readily washed. Mantles made from the products thus purified gave a light of over 123 candles, or about 20 per cent. more than those from the No. 2 nitrate, and 2·3 times as much as those from the original salt. In most cases, this method of separation will attain its object.

The author would point out that the difficulties in the analysis of the rare earths are really not greater than in the separation of the alkali metals, &c., and that it is as practicable to control the fitness of thorium for lighting purposes as it is to deduce the effect of chemical impurities on the physical properties of many of the heavy metals. In dealing analytically with the elements of the cerium and zirconium groups, only the well-known components have to be considered, and not components which can only be detected spectroscopically. It should be pointed out that it is possible to prepare cerium quite free from didymium. Less than 0·01 per cent. of didymium in cerium, and less than 0·001 of cerium in didymium, can be detected and separated with certainty. Cerium separated according to the older methods can be freed from didymium by zinc oxide. The elements of the yttrium group separate from the residual solution with a little didymium, and are purified further by potassium sulphate. Thorium and zirconium are separated by precipitation with thiosulphate.

The practical determination of the thoria in monazite is simpler, as the best commercial monazite rarely contains over 6 per cent., and usually only $3\frac{1}{2}$ to $4\frac{1}{2}$ per cent., of thorium oxide; and it is, under these circumstances, immaterial whether the oxide determined contains trifling amounts of foreign oxides. The thorium can, in practice, be precipitated as phosphate directly from the solution of the monazite in sulphuric acid. Usually, however, the sulphuric acid solution is precipitated by oxalic acid, then decomposed by soda in excess, so that most of the thorium passes into solution; and crude thorium oxalate is thrown out of solution by the addition of hydrochloric or sulphuric acid. The monazite carbonate is dissolved in hydrochloric acid, and the remainder of the thorium precipitated as thiosulphate. This thiosulphate, which contains didymium and cerium, is purified along with the crude oxalate, as described above.

Solubility of Gases in Organic Liquids.—According to Signor H. Levi, of Padua, experiments have shown that methyl alcohol (wood spirit) and acetone have almost the same power of dissolving oxygen, methane and ethylene. The solubility decreases regularly with an increasing temperature; thus following the universal law on the absorption of gases.

REGISTER OF PATENTS.

Incandescent Mantles.—Dickson, W. K. L., of the Hotel Cecil, Strand. No. 4707; March 5, 1901.

This arrangement is particularly applicable to mantles intended for use with gas and air under pressure.

The invention consists: (1) In strengthening mantles by means of locally-applied refractory material which, when dried on, thickens, and holds together the mantle—such refractory material having a co-efficient of expansion with heat sufficiently near that of the material of the mantle not to cause rupture from unequal expansion of the parts of the mantle in use. (2) In forming vent-holes, near the top of the mantle, so as to prevent excess of pressure existing within the mantle; such holes being formed by punching through the structure of the mantle, and then strengthening the cut edges by means of refractory material applied as a paste.

In one modification, the mantles (after being passed through the usual processes of manufacture, and preferably after stiffening by collodion or the like for transit) are impregnated or coated, for a portion of their lengths from the top and bottom edges, with (say) fire-clay made into a paste or cream with silicate of soda or its equivalent and water or alcohol. A suitable paste would be obtained by employing a 10 per cent. solution of silicate of soda in water, alcohol, or commercial methylated spirit, and mixing this with a suitable quantity of finely-ground Stourbridge fire-clay, till the mixture is rather stiffer than ordinary cream.

Charging and Drawing Gas-Retorts.—Carpenter, C., of the South Metropolitan Gas Company, and Biggart, A. S., of Arrol and Co., Limited. No. 4964; March 8, 1901.

The object of the present invention is "to introduce a type of plant simple in construction, with the wearing parts easily accessible, and at all times under the observation of the operator, while at the same time the apparatus will retain as far as possible mechanical devices which are more or less familiar to the workmen employed."

Fig. 1 (p. 831) is an elevation of the discharging or drawing machinery, with a plan view of the beam detached. Fig. 2 is a side elevation of the right-hand side of fig. 1. Fig. 3 is a front elevation of the charging machinery. Fig. 4 is a side view of the left-hand side of fig. 3.

A is a platform mounted on wheels and provided with uprights or pillars to carry at a height above the level of the highest retort a second platform, on which are mounted bearings for vertical transverse and longitudinal shafts, provided with pulleys and toothed wheels for operating the various parts of the apparatus; the pillars and second platform being made rigid by stays. On the lower platform is carried a motor B, of any suitable character, provided with pulleys and the usual accessories for driving the various parts of the apparatus, and also for working the carriage along the rails. C is the beam which carries either the rake or the pusher, as the case may be. This beam consists of two channel-iron girders C, set on edge and facing inwards at a suitable distance apart, and supported by straps D attached to chains which pass over pulleys E, and are secured at the other end to counterweights F. The beam is also provided with lateral projections or guides G, which slide in contact with the pillars of the carriage, and thus steady the beam and keep it rigid. Attached to the beam C is a bracket H, in which are the bearings for the shaft I and for a vertical shaft J. This shaft J is square, and is driven through mitre gear from a shaft K, which is driven from the motor B by a belt and pulleys carried on one end of the shaft. The short shaft I on the beam C carries a cylindrical drum (or it may be a fusee of varying diameters), to vary the speed of movement of the rake-rod with which the fusee is connected by a chain; and this shaft I is driven by mitre gear from the square shaft. The object of making this shaft J square is to allow for the rise and fall of the beam according to the position of the retort it is desired to operate upon; the mitre-wheel sliding freely on the shaft, which is mounted in step and other bearings.

On the rear end of the shaft K is a pulley, which (by a belt) drives the mechanism L for working the carriage along the rails.

The raising and lowering of the beam C will be effected by driving the shaft of the pulleys E by worm-gear from the transverse shaft M, which is driven by a belt from the motor B, or in any other convenient manner. The chains connecting the counterweights F with the beam are thus operated in either direction as required.

N is the rake, the rod or bar of which is provided at its rear end with wheels or slippers, which run or slide on the bottom flanges of the girders C. To this end of the rake both ends of the chain O are attached; and this chain is wound on the fusee so that, according to the direction in which the fusee is driven, the rake will be drawn out or drawn back.

Carried by the beam C is what may be termed a lifting or spacing bar P, of composite construction; being made of two flat strips or bars of iron suitably connected together and carrying between them at each end a grooved pulley. The function of this bar is to slide along the top flange of the beam C to act as a spacing-bar for the chain O of the rake—the chain being passed round each pulley—and also as a lifting bar for the rake. For this latter purpose, the rake N works in a socket Q, which is carried by a transverse piece pivoted to two curved links R. The other ends of the links R are pivoted to the bar P. The links R work on bowls mounted on studs, one on each side of the beam; and they are kept in contact by a spring-controlled lever. When it is desired to use the rake, the fusee is thrown into gear, and is rotated, by which means the tension is put on (say) the left-hand chain O to draw the rake forward. The effect of putting tension on this chain will be to push back the bar P before the full strain comes on the rake-end. By pushing back the bar P, the curved links R will be drawn back; and, by reason of the fixed bowls on which the links ride, the rake-head will be raised so that it will enter the retort at the upper part, and will pass along the length of the retort clear of the incandescent material therein. When the rake-head has reached the end of its stroke—whatever that may be—the movement of the rake is automatically stopped by shifting the belt upon the pulleys (and the direction of rotation of the fusee is

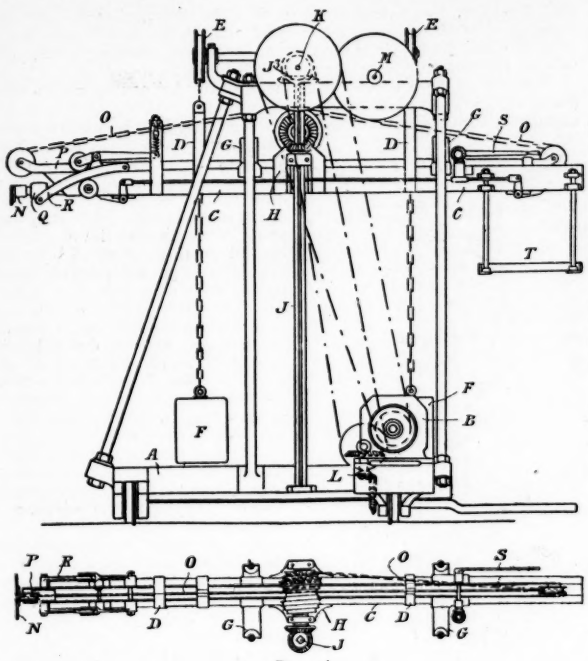


Fig. 1.

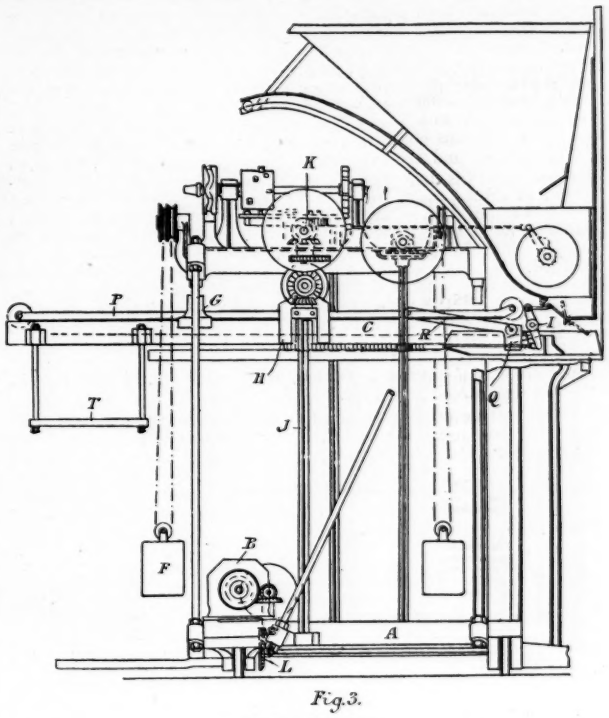


Fig. 3.

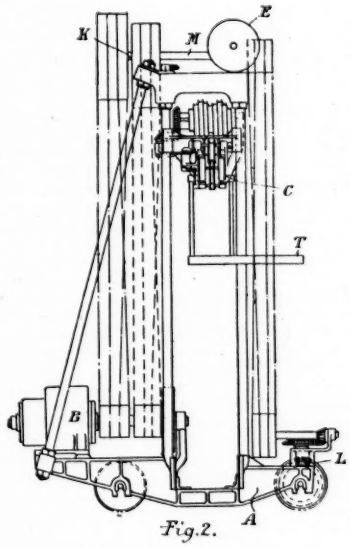


Fig. 2.

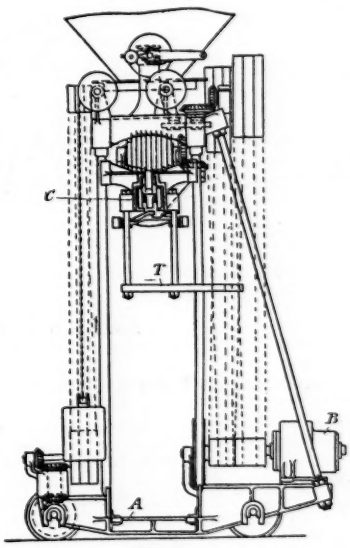


Fig. 4.

reversed), by a hand lever S suitably connected with the belt-shifter; and the tension is then put on (say) the right-hand chain O.

To ensure the hand-lever S being moved at the proper time, the wheels of the rake-bar will, at the end of its stroke, actuate levers which, by means of suitable connections, will move the hand-lever S. This will have the effect of pushing forward the bar P before the strain is felt by the rake. The curved links R and socket Q are also pushed forward; and the rake will thus be lowered into the incandescent material partly by its own weight and partly by the action of the spring-controlled lever. As the movement of the fusee continues, the rake will be drawn out of the retort, bringing with it the coke; and thus the discharging of the retort is effected.

When it is desired to withdraw the rake-rod on the ingoing level, the sliding-bar P is prevented from moving forward when the direction is changed by means of locking mechanism of any convenient character, and operated by a hinged pawl or other mechanism within reach of the attendant who stands on the platform T.

Referring now to figs. 3 and 4, which illustrate the charging mechanism, the apparatus is constructed mainly on the same lines as the discharging apparatus—that is to say, it is composed of a main platform A mounted on wheels, and having a motor B, or its equivalent, and pillars which carry a second platform. There is also a rigid beam C carried in the same manner as in the former case, with a lifting-bar P, which, however, operates in the reverse direction—that is to say, a pusher (the part corresponding to the rake in the former case) connected therewith is lowered to go forward and raised to come back.

The pusher and pusher-bar pass through a socket Q carried by a link R, pivoted to the lifting-bar P, as before. The socket is provided with rollers, which run upon inclined planes suitably fixed on the girders C of the beam. A hopper is placed at the side of the apparatus nearest the retorts, to receive coals from a shoot platform or trunk. At the bottom of this hopper is a rotatory device, by means of which a regulated quantity of coal is delivered intermittently on to a tipping plate or tray. From this plate, the coal is allowed to fall intermittently in front of the pusher on to a shoot which bridges the space between the apparatus and the mouth of the retort. From this shoot, the coals are pushed into the retort a greater or less distance as may be required. The charge of coal is "divided up into small doses, each of which is pushed a less distance into the retort than the previous one; so that, when fully charged, the retort has, in effect, so many (say, five or six) doses of coal lying on the floor, but all so evenly and well laid as to represent a continuous layer." The stroke of the pusher is automatically shortened at each stroke, for the purpose just named.

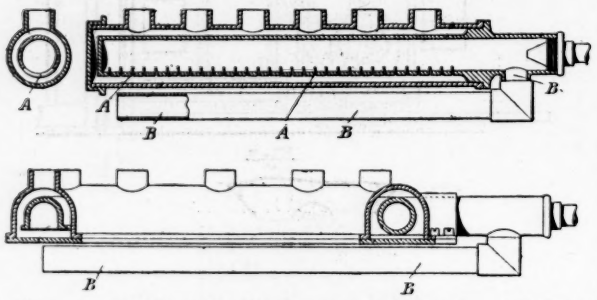
The coal-hopper is a fixture in the apparatus; but the plate or tray is fixed to, and is raised and lowered with, the beam C, so that it will always maintain the same relative position with regard to the shoot, irrespective of the height of the hopper. The rotation of the coal-measuring device is effected by a pawl-and-ratchet motion, operated by a rod through a series of bell-cranks from a pin on a horizontal crown-wheel mounted on a pillar carried by the upper platform, and driven by internal gear from the shaft J or in any other convenient manner. The pin carried by this wheel enters a fork in the lever, so that, as the wheel continues its rotary motion, the lever rocks, and, through bell-cranks and rods connected therewith, communicates motion to the rod and drives the pawl-and-ratchet mechanism for delivering the charge of coal. This movement is properly timed to deliver the dose of coal on to the tipping-plate, which is pivoted to a cross piece or in any other convenient manner, and is tipped by a rock lever through a rack-rod operated by a pinion on the vertical shaft rotated by the crown-wheel. This mechanism is also timed to deliver the dose of coal on the shoot in front of the pusher.

The movement of the pusher is regulated by the crown-wheel in the following manner: On the face of this wheel are a series of studs or

projections, arranged eccentrically of the axis. Mounted above the wheel on a horizontal axle is a drum, the surface of which is provided with a series of studs corresponding to those on the wheel. As the wheel is rotating, a stud (say, that furthest from the centre) will come into contact with its corresponding stud on the drum, and so give a partial rotation to the drum—that is to say, until the studs are clear of one another. This will operate a multiple-grooved cam on the axle of the drum, which will actuate a belt-shifter to shift the reversing belt on to a fast driving pulley connected with the pusher-chain drum or fusee, so that the direction of rotation of the drum will be reversed. The crown-wheel, in consequence, turns in the opposite direction, and a stud comes in contact with a narrow stud-drum, which reverses the grooved cam and, by means of lever and link, shifts the forward belt on to the driving pulley; and so the cycle of operations goes on till the retort is charged. By this time, the next stud of the series will strike against the corresponding stud, and the action before described will be repeated. By these means, the travel forward of the pusher may be regulated according to the distance it is desired to push each dose of coal into the retort.

Atmospheric Gas-Burners.—Glover, R. T. & J. G., of Clerkenwell. No. 8387; April, 23, 1901.

The patentees propose constructing an atmospheric gas-burner from two tubes, one inside the other; the gas and air passing through the inner tube and out at its lowest part, and around same to the burner or nipples at the upper part of the outer tube. The inner tube has at its under surface perforations or slits A fitted or not with wire gauze; while the outer tube carries the burner perforations or nipples at its upper part.



The air supply is preferably drawn in through a long tube B; so that all back-flash to the gas-nipple is prevented, by reason of the moving column of air in the tube carrying with it the mixture of gas and air away from the nipple and preventing any ignition thereat. The stream of gas issuing from the nozzle sucks the air up through the air-tube and commingles with it in the inner tube, where it passes through the perforations, slits, or wire gauze, and travels around the outside of the inner tube between the two tubes to the burners, where it is ignited and burns "with perfect combustion," having become thoroughly mixed in the two chambers. The circuitous travel of the mixture before it reaches the burner is said to assist, with the column of air in the air-tube, in preventing any back-firing.

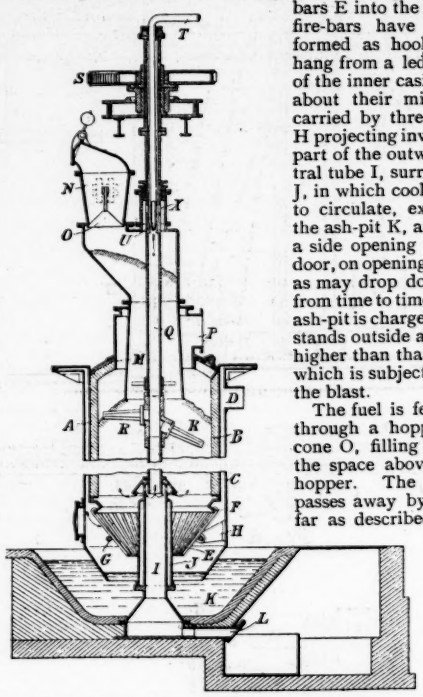
Mantles for Incandescent Gas Lighting.—Dickson, W. K. L., of the Hotel Cecil, Strand. No. 9738; May 10, 1901.

This is a modification of the patentee's earlier patent, No. 4707 (see p. 830); the claims for the present invention being: (1) Strengthening mantles for incandescent lighting by means of silicate of soda or potash uniformly distributed, and forming from ½ to 5 per cent. of their weight. (2) A process for strengthening mantles, consisting in depositing thereon, by spraying or dipping (after collodionizing for transit), from ½ to 5 per cent. of its weight of silicate of soda. (3) A mantle strengthened by the uniform deposit of ½ to 5 per cent. of its weight of silicate of soda or potash, and having its edges locally strengthened by means of refractory material. (4) A mantle strengthened by the uniform deposit of ½ to 5 per cent. of its weight of silicate of soda or potash, provided with punched vent-holes, and having its edges locally strengthened by means of refractory material. (5) A mantle having a top-edge of frog-mouth form, and loops for support attached to the centre of each lip, so as to allow of increased vent with increased pressure within the mantle.

Gas-Producers.—Mond, L., of Regent's Park, N.W. No. 8449; April 24, 1901.

In patent No. 12,440 of 1893, the inventor described a gas-producer specially adapted for converting ordinary slack or small coal into producer gases containing a minimum of tarry condensable matters, and obtaining, as a bye-product, a maximum of ammonia. The producer is cylindrical in form, and provided with a grate of the shape of an inverted truncated cone, through which the blast is admitted. In the top of the producer a bell is inserted, reaching a considerable distance down into it; and this bell is always kept partly filled with the raw fuel, the volatile constituents of which are, to a certain (but small) extent, distilled off in the bell, and pass through, and partly over, the incandescent fuel, and are thereby converted into permanent gases. The fuel, thus deprived of a portion of its volatile matter, passes continually into the producer, and the greatest part of it sinks down right underneath the bell to a considerable depth, forming an egg-shaped mass of dead fuel; while the combustion in the producer takes place between this mass of dead fuel and the walls of the producer. The bulk of the volatile matters in the fuel are thus distilled off in the centre of the producer itself, and have to pass through the surrounding incandescent fuel before they can escape. In this way, the volatile matters in the fuel "are nearly completely converted into permanent gases without destroying any noticeable part of the ammonia produced by the gasification of the fuel, if the amount or character of the gasification in the fuel is not quite exceptional." For certain qualities of fuel, however, the patentee states that the device has not proved capable of producing a gas sufficiently free from tarry condensable matters; and the object of the present invention, therefore, is "to provide for the convenient treatment of such fuels."

The body of the producer has a metal casing A, lined with refractory material B, and an outer metal casing C. Air is blown at D into the annular space between the casings; whence it passes between the fire-bars E into the body of fuel. The fire-bars have their upper ends formed as hooks, by which they hang from a ledge F at the bottom of the inner casing; while they rest about their middle in a ring G carried by three or more brackets H projecting inwards from the lower part of the outward casing. A central tube I, surrounded by a jacket J, in which cooling water is caused to circulate, extends down below the ash-pit K, and has at its bottom a side opening L provided with a door, on opening which such matters as may drop down the tube I can from time to time be removed. The ash-pit is charged with water, which stands outside at a level somewhat higher than that within the casing, which is subject to the pressure of the blast.



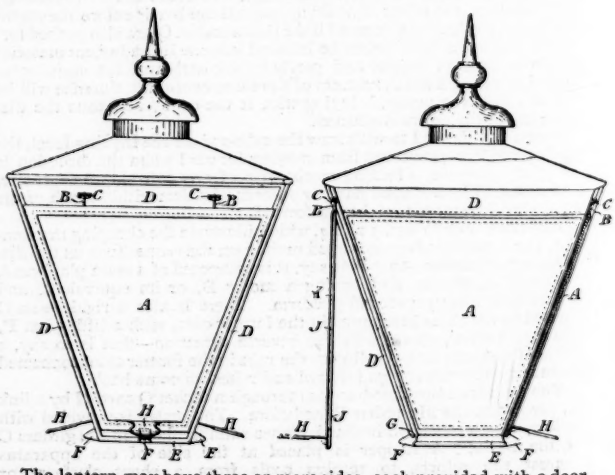
The fuel is fed in the usual way through a hopper N, and over a cone O, filling up the bell M and the space above it nearly to the hopper. The gas as generated passes away by the outlet P. So far as described, the apparatus is constructed and operates substantially in the same manner as in the earlier arrangement.

According to the present invention, down the centre of the producer is passed a tubular shaft Q, having agitating arms R projecting from it, and having fixed on its upper part a wheel S, which is caused to revolve by any suitable motor. Into the upper end of the shaft enters a steam-pipe T, which terminates in a nozzle U arranged to operate as an injector. Above the nozzle there are lateral holes X in the tubular shaft, through which hot gas and vapours from the upper part of the producer are drawn in; and these are passed through the raw fuel in the bell by the action of the injector, and forced down into the middle of the incandescent fuel at a level a little above the fire-bars, through the open lower end of the shaft and suitable openings in the casing in which the shaft revolves. The agitators serve to break up the fuel when it tends to cake.

By thus drawing a certain quantity of the hot gas produced in the body of the producer through the fuel in the hopper, the amount of volatile and tarry matters in the fuel is said to be reduced before the fuel enters the body of the producer "to such an extent that the gas made in the body of the producer is sufficiently free from tarry matters for all practical purposes, while the tarry matters distilled off in the hopper are forced by the steam-jet in the hollow vertical shaft right through the mass of incandescent fuel inside the producer, and are thus converted into permanent gas."

Street-Lanterns.—Bray, G., of Leeds. No. 2631; Feb. 3, 1902.

This invention relates especially to lanterns fitted with incandescent mantles; and it has for its object the facilitating of the opening and shutting of the lantern-door for the purpose of lighting, cleaning, and glazing.



The lantern may have three or more sides, each provided with a door A, hinged at the top by hooks B secured to the frame of the door, and

each hook passing through, and combined with, a staple C, formed by, or attached to, a bar D of the lantern. The bottom rib E of the lantern is provided with a rigid projection F, having a rising inclined face terminating with a recess G close to the lower rib of the lantern-frame, and of such width as to admit of the bottom bar of the lantern-door for securing the door in a closed position. On opening the door, it is raised by the projection H attached to it clear of the recess G—the hooks B sliding upwards through staples C, so that, on allowing the bottom portion of the door to leave the lantern, the bottom bar slides down the inclined face of the projection, and is suspended in a vertical position by the hooks and staples (as shown in the right-hand view); thus allowing the lantern to be lighted. On closing the door, the bottom bar slides up the inclined face until it arrives at the recess G, into which it drops, and secures the door in a closed position.

The door-frames are provided with an inner flange J, secured so as to leave a recess K for the reception and retention of the glass. On liberating the bottom bar from the recess G, and turning the door upwards, the hooks B can then be disengaged from the sustaining staples C, and the door removed from the lantern for cleaning, repairs, or other purposes.

APPLICATIONS FOR LETTERS PATENT.

5851.—Cooney, H., "Prepayment gas supply controlling apparatus." March 10.
5868.—Howell, H., "Hydraulic gas-compressor." March 10.
5912.—Simpson, W. M., "Bunsen burners." March 11.
5920.—Bartlett, F. G., "Controlling and regulating gas-burners." March 11.
5922.—Ryland, T. J. F., and Robinson, F. W., "Incandescent gas-burners." March 11.
5996.—Clerk, D., "Internal combustion engines." March 11.
6007.—Medd, G. F., "Gas escape indicator." March 11.
6019.—Hodder, A. E., and Lester, J. B. G., "Rotary pumps." March 11.
6038.—Tyson, J. J., and Newton, T., "Cash-boxes of automatic gas-meters." March 12.
6060.—Young, T., "Connections for gas or water pipes." March 12.
6063.—Hanton, P. S., "Domestic gas firing and cooking appliances." March 12.
6098.—Colbran, J. B., "Gas-lamps." March 12.
6137.—Duffek, A., and Beschorner, A., "Incandescent gas-lamps." March 12.
6178.—Sims, W. A., "Acetylene gas machine." A communication from F. L. H. Sims. March 13.
6179.—Sutton, C. J., and Rudd, J., "Preventing shock to incandescent gas-mantles." March 12.
6195.—Silbermann, A., "Burners." March 13.
6200.—Fielding, J., "Gas-producers." March 13.
6221.—Macquet, J. B., "Acetylene generators." March 13.
6240.—The Hygienic Stove Company, Ltd., and Greenwood, E. P., "Gas heating-stoves and water-heaters." March 14.
6241.—The Hygienic Stove Company, Ltd., and Greenwood, E. P., "Combined gas, coal, or coke fire." March 14.
6264.—Whitehead, J., E., & H. J., "Gas and other illuminations." March 14.
6267.—Keith, J., "Rotary fans." March 14.
6291.—Brodin, C. F., and Schepeler, H. A., "Acetylene gas-generators." March 14.
6297.—Lange, J. C. O., "Pressure regulators for conduits containing gas or air." March 14.
6314.—Falk, Stadelmann, and Co., Ltd., "Incandescent mantles." A communication from A. Barella. March 14.
6315.—Falk, Stadelmann, and Co., Ltd., "Means for turning on and off bye-pass and other lever cocks used on street-lanterns." A communication from A. Barella. March 14.
6398.—Westrope, G. W., "Liquid meters." March 15.
6423.—Lange, C. O., "Maintaining a uniform pressure in high-pressure gas supplies." March 15.
6427.—Still, W. M., "Lamps for over-head lighting." March 15.
6454.—Powell, F. A., and Tournet, E., "Carburettors." March 17.
6534.—Denison, G. H., and Broadhead, J. W., "Weighing machines." March 18.
6542.—Crossley, J., "Gas or oil driven pneumatic hammers." March 18.
6547.—Sutcliffe, H., "Flexible supporting device for incandescent burners." March 18.
6548.—Jenkins, J. & R., "Fluid-pressure engines or pumps." March 18.
6566.—Wilson, P. J., "Gas or oil driven pneumatic hammers." March 18.
6610.—Jeffery, C., "Anti-vibrating burners for incandescent gas lighting." March 18.
6639.—Gulich, E. N., and White, R. J., "Rotary pump, applicable also as a fluid meter." March 18.
6736.—Paul, F., jun., and Gundlack, A. F., "Collapsible tanks for gas-generating plants." March 19.
6826.—Bishop, D. W., "Acetylene gas-generators." March 20.
6857.—Nicholls, G. G., "Supporting mantles for incandescent gas lighting." March 20.
6858.—Bishop, D. W., "Acetylene gas-generators." March 20.
6974.—Denayrouze, L., "Incandescent lamps burning vapour of liquid hydrocarbon." March 21.
7010.—Milnes, H., and Stewart, W. H., "Fork for incandescent burners." March 22.
7087.—Pickering, W. S., "Centre-valves for gas-purifiers." March 22.

In the Chancery Division of the High Court of Justice, last Tuesday, Mr. Justice Kekewich acceded to an application by John Wright and Eagle Range, Limited, to extend the field of their operations so as to find profitable employment for their capital, which had been increased from £120,000 to £300,000, of which £223,000 had been paid up.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Inclined v. Horizontal Retorts.

Sir,—In reply to the letter of Mr. Drory, in your issue of 18th inst., I was too much interested in the carefully-worked-out figures given by Mr. Drory to neglect the comparison of the retorts; but the number of men given in my last letter for the work quoted by Mr. Drory should (as stated) do the work easily, as the estimate was made for moderate working.

The pipemen mentioned allowed one man to each machine—the usual practice. The item of 56 pipemen given by Mr. Drory, means that it takes one man per shift to attend to every three ovens, or 28 retorts, at a cost of 4·9d. per ton. No wonder Mr. Drory prefers the inclines with only four pipemen, costing 0·35d. per ton.

But does this matter of pipemen settle the question as to which system of carbonizing is the best? In this case, it seems to do so where the cost for pipemen is 47 per cent. of the total cost of carbonizing. But I venture to think that other deductions may be drawn from the same figures.

Some one has written that, if only one oven of inclines worked satisfactorily, it would not matter if there were a hundred failures. Does not this saying cut both ways? To get down to bottom-facts, why should 87 per cent. more retorts be required with horizontals to carbonize the same quantity of coal? With larger retorts, in settings designed to suit, would it not be possible to have the percentage the other way if Mr. Drory so desires?

It makes little difference to the men on the machines what the weight of the charge is; and the work of the other men would then be equalized. Perhaps with larger retorts and heavier charges the necessity for so many pipemen might disappear—seeing that the heavy charges work so well in the inclines. The comparision of cost then would be rather striking.

As to our work here, in every case the pipemen clear the ascension pipes thoroughly before the retort is recharged. The coals carbonized are mainly splints and caking coals. Very little shale is now used, as oil is preferred for enrichment. The retorts are 9 feet long, and the heats enable us to carbonize 17 to 21 cwt. of coal per retort per day.

Dawsholm, Glasgow, March 27, 1902. Alexander Wilson.

The Charge for Gas for Illuminations.

Sir,—Referring to your Editorial Note on "Gas Illuminations for the Coronation," and the proposal in some quarters to charge 1d. per jet for the gas for one night, you ask the pertinent question, "What is a jet?" which admits of a variety of answers. It may be of some service at this time to point out that the usual outdoor copper tube illumination gas-devices may be taken as consuming ½ cubic foot of gas per jet per hour at 1-inch pressure, when properly drilled with equidistant jet holes (say, 14 jets per foot run); and this would give a basis of calculation according to the outline of the devices used. If the conditions of pressure were increased, the consumption would, of course, be proportionately greater, and at 2 inches would be ¾ foot per jet per hour.

Milton House, Edinburgh, March 28, 1902. D. Macfie.

Explosions in Street Boxes.

Sir,—I shall feel obliged if you will correct one or two inaccuracies in the report of my evidence, contained in your issue of yesterday.

In regard to "unaccounted-for" gas, I explained the various items which it comprised, and estimated the actual leakage (one item only) at 1½ per cent. on the total make. As to the bottomless electric boxes employed by the Islington Borough Council, I asserted that they constituted a most serious danger, enhanced by ventilators, flush with the pavement, at intervals of half-a-mile, which were receptacles for lighted matches, fusees, &c.—not the lids, as reported.

In regard to cast *v.* wrought iron, I entered fully into the reasons why, though the latter was most suitable for services, it was altogether unsuitable for large mains. On the question of the porosity of the two, your report places it the wrong way about.

G. F. L. Foulger, Distributing Engineer.
The Gaslight and Coke Company, 146, Goswell Road, E.C., March 26, 1902.

Photometers and Appliances for Testing Coal Gas.

Sir,—I think few, if any, gas engineers have ever tested the apparatus they use, judging from my own unfortunate working experience.

Some years ago, I tried to obtain a clock which could be used instead of my pocket chronograph—leaving both hands free. The best of these varied fully 7 per cent. between its up and down rate. The dial was incorrectly divided; and the workmanship inside, spite of its very high price, was simply atrocious. The balance-spring was a single coil—the balance not even balanced, and the start and release wonderfully uncertain. I have seen such specimens of work in photometer rooms; and it would appear that the results are actually taken as correct. I am still waiting to see (and to purchase) a chronograph clock with which it is possible to take observations with less than 2 per cent. of error. My pocket chronograph, which is always used, has been verified at Kew Observatory, and can be absolutely trusted within 4 seconds in twenty-four hours. For such important work as gas-testing, every clock or chronograph used ought to have a Kew certificate.

Still worse than this, my standard test-meter—although correct, on the average, in long runs—is even more unreliable. It was specially made for the most exact work. The dial is graduated to 1/100 cubic foot; and yet this, although recently sent for cleaning and examination, has varying errors in different parts of the drum, amounting in some cases to over 20 per cent. If a test-meter—supposed to be made with

special care for the most precise work without consideration of cost, by one of the largest, and considered the best, makers in the country—shows such errors as these, what will the average test-meter do? Dry meters, of course, are useless for measuring small quantities of gas; but it ought to be practicable to measure parts of the cubic foot correctly with a wet meter.

With such apparatus, the fractions of a candle in illuminating power, as taken and published, are rather a farce. No wonder authorities differ. At present I am in want of a test-meter with a guaranteed maximum error in registering fractions of 1 cubic foot, and a chronograph clock also with a guaranteed maximum error. I have wanted them for years. Do such things exist; and, if so, where are they to be obtained?

Warrington, March 25, 1902. THOS. FLETCHER.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the rising of the House last Wednesday for the Easter recess:—

Bills read a second time and committed: Birmingham Corporation Water Bill, Hamilton Gas Provisional Order Confirmation Bill.

Bills reported, with amendments: Grand Junction Water Bill, Kent Water Bill, West Ham Gas Bill.

Bills read the third time and passed: Commercial Gas Bill, Higham Ferrers and Rushden Water Board Bill.

By last Tuesday, the day limited for presenting petitions against the London Water Bill, upwards of 70 had been deposited. The following are the names of the members nominated by the Committee of Selection to serve on the Joint Committee to whom the Bill has been referred: Sir William Arrol, Sir William Houldsworth, Sir James Kitson, Sir Edgar Vincent, and Mr. M'Crae.

HOUSE OF COMMONS COMMITTEE.

WEST HAM GAS BILL.

Monday, March 24.

The Committee considered the clauses in the Bill this morning.

By a rider, section 12 of the Act of 1889 was repealed, and the standard price to be charged was fixed at 2s. 11d. per 1000 cubic feet. In regard to tests for illuminating power, the gas was to be burned at such rate as to yield the maximum light for which the burner was designed.

Mr. BAGGALLAY brought up a clause to carry out the decision of the Committee with regard to the testing-place, which, after some discussion, was passed in the following form:—

If and so soon as the Urban District Council of Leyton shall, at their own expense, at any time after the 1st day of January, 1903, have provided a proper testing-place, to be reasonably approved by the Company, connected with the 12-inch main of the Company in the High Road, Leyton, and shall have provided and fixed therein, to the reasonable satisfaction of the Company, all the necessary apparatus and machinery for testing the purity, illuminating power, and pressure of the gas supplied by the Company similar to that at the time in use at the existing testing-place of the Company, or shall have, to the like satisfaction, removed the apparatus and machinery from the existing to the new testing-place, and shall have conveyed and handed over such testing-place, apparatus, and machinery to the Company, such testing-place shall, in lieu of the testing-place provided for by section 24 of the Act of 1889, be deemed to be the prescribed testing-place required to be provided in conformity with the Gas-Works Clauses Act, 1871, and shall be vested in, and kept and maintained in good repair and working order by, the Company accordingly, and the Company may discontinue the aforesaid testing-place provided for by the Act of 1889.

The other clauses were agreed to; and the Bill was ordered to be reported to the House.

HOUSE OF COMMONS COMMITTEE.

KENT WATER BILL.

Monday, March 24.

(*Before Mr.* EUGENE WASON, *Chairman, Lord* BALCARRES, *Mr.* C. P. TREVELYAN, *and Major* KENNETH BALFOUR.)

This was a Bill for empowering the Kent Water-Works Company to raise further capital, to extend their area of supply, and to acquire additional lands.

Mr. LITTLER, K.C., and Mr. LEWIS COWARD appeared for the promoters. Mr. BALFOUR BROWNE, K.C., and Mr. FREEMAN, K.C., appeared for the London County Council; the Hon. J. D. FITZGERALD, K.C., for the Surrey County Council; Mr. WEDDERBURN, K.C., for the Local Authorities of Bexley, Bromley, Dartford, and Sevenoaks; and Mr. DU CANE, for Godstone.

Mr. LITTLER, in opening the case for the promoters, said the Company was an exceedingly old one; and at the present time supplied about 30 square miles inside the Metropolis and something like 149 square miles outside. The total capital amounted to £1,150,644, which had all been expended with the exception of £19,187; and there was urgent need for further money. They were not asking for an extended area, nor for any new works; but simply for money to carry on the current works. Additional means and other things were necessary. The amount originally asked was £300,000; but, on the suggestion of the Local Government Board, it had been reduced by one-half, and the Company now only asked for £150,000. There were no unusual provisions in the Bill. Counsel then proceeded to deal with the various petitions raised against the measure. Among other points, the question of charge for the water was raised. He contended that this was not a proper matter to be raised before the Committee. The quality of the water was objected to; but in all previous inquiries representatives of some of the local authorities who now raised this point had spoken in favour of it—in fact, there had never been any complaints till now. Counsel then read portions of evidence at these inquiries in support of his contention, and concluded by asking the Committee to come to the conclusion that the money asked for was absolutely necessary.

Sir *William Hart-Dyke*, M.P., Chairman of the Company, was called and examined by Mr. LEWIS COWARD. He said that the purity, excellence, and abundance of the water supplied had never been contested for a moment. Throughout all the inquiries and Commissions which from time to time the Company had appeared before, there was not one jot or tittle of evidence to show that the water was not excellent in quality and very good with regard to quantity. There had been no complaint as to the charges. Notwithstanding the Government Bill now pending, the present measure was a necessity.

Mr. BALFOUR BROWNE (in cross-examination): If you say you have sufficient water, there is no necessity for the Bill; and if you say you have not, then it looks as if your Company were not at present in a position to perform its statutory duty, and might be bought more cheaply. Which do you elect?

Witness: In these matters we must be guided by our Engineer with regard to future supply.

Do you agree that, if the Government Bill passes, you should not do anything which should prejudice the purchasing authority, whoever that may be?—We must be able to continue our operations for the next two years.

In cross-examination by Mr. WEDDERBURN, witness said that, in order to pay the 10 per cent. dividend, the Company required some £80,000; and they had also been paying back-dividends as well. In 1901, £40,000 of back-dividends had been paid. He was not aware that, with the exception of Lambeth Company, the Kent Company's charges were the highest in London for houses under £30 in rateable value. Both in 1898 and much more recently there had been considerable complaints about the hardness of the water. He had, however, pointed out that, by the use of three cisterns, the water could be softened.

Mr. WEDDERBURN: Is it the fact that the cost of production of the water is 2½d. per 1000 gallons, and that you are charging 10d.?

Witness: I cannot say that.

In re-examination by Mr. LITTLER, witness said that the Company charged the same price as many provincial water undertakings, some of which were owned by corporations. He neither wished to enhance, nor to detract from, the value of the Company's undertaking by the present Bill.

After the short adjournement,

The CHAIRMAN said the Committee had considered the matter, and did not think they would be justified in going into the question of softening the water. The present was a mere temporary measure to tide over certain difficulties for the next two years.

Mr. WEDDERBURN said he understood that the contention of the Company would be that they were not really a London Company at all, and should not be included in the Water Board.

Mr. LITTLER: Please do not say that.

Mr. WEDDERBURN said he had seen the Company's petition.

Mr. LITTLER: No petition has been presented. The one you have seen was against the County Council Bill, not against the Government measure.

Mr. *A. Dickson*, a Director of the Company, examined by Mr. LITTLER, said that the works now in progress were absolutely necessary in view of the extraordinary growth of the population in the neighbourhood. In 1886, the number of supplies was 68,127, which had increased in 1896 to 84,331, and in 1901 to 100,942. In the first ten years, the average additional number of supplies was 1620, and in the last five years this had risen to 3322—more than double. The Company contemplated the present step some years ago, but had a difficulty with regard to the acquisition of sites. All that was required was simply that which was necessary in order that the Company might carry out their statutory obligations. The absolute requirement of the Company at present was £146,564. It was not possible for the Company to tide over without further capital.

Mr. FITZGERALD: The powers which might be innocent in your hands, if given to a Trust over the whole of London, might assume a very different complexion as far as Surrey is concerned?

Witness: I have no reason to anticipate that.

Mr. FITZGERALD: There is a well in Surrey which you propose to take. What objection can you have to saying this shall be applied only to Surrey?

Mr. LITTLER: The well is on the Surrey side of the hedge, that is all.

Witness: I do not see why any limitation should be made with regard to the well.

In cross-examination by Mr. FREEMAN, witness said he could not see the equity of interfering with the ordinary business of the Company in the interval between the present time and the purchase by the Water Board, if such took place.

Mr. WEDDERBURN: We are not to be allowed to apply to the Committee for anything which might have the effect of putting the Company to greater expense or lowering their charges, and so reducing their purchasable value. Would it not be an unfair thing that you should be allowed to get capital and appreciate your value?

Witness: No. Do you say that we should stop the business of the Company?

Mr. *William Morris*, M.Inst.C.E., Engineer to the Company, presented a table showing the estimated expenditure on the proposed new works. The totals were: Mains, £97,053; pumping stations, £36,630; reservoirs, £17,000. Adding to these sums 10 per cent. for contingencies (£15,068) made £165,751. Then deducting the balance in hand on March 12, £19,187, gave a final amount of £146,564.

Mr. FITZGERALD: The County Council of Surrey do not desire to inconvenience the Company; they only want to protect themselves after the transfer. If you could indicate to the Committee where you think you would supply the water from the Surrey well before the transfer, then at once there is a basis of agreement.

Witness: I could not answer that question in detail.

The further cross-examination was directed to proving that the various works proposed were not immediately necessary; but witness declined to accept this view, and maintained that they were certainly requisite.

Mr. LITTLER intimated that in all probability he would call no further evidence.

Tuesday, March 25.

Mr. LITTLER said that, after consideration, he was prepared to add the following clause to the Bill: "In the event of the passing of the London Water Bill now pending in Parliament, or of any enactment of the like effect within the next three sessions of Parliament, nothing in this Act contained shall be deemed to add to, or derogate from, the value of the Company's undertaking." With regard to Tatsfield, which desired to be supplied with water by the Company, if the Committee decided that this district should be included, he would ask for a similar provision to that obtained by the Company in 1888, the effect of which was to place the consumers in Tatsfield in the same position as other consumers of the Company, unless special circumstances existed which rendered the cost of supply greater to the Company, when there should be a high-service charge.

Mr. BALFOUR BROWNE then addressed the Committee on behalf of the London County Council. He said there were two matters which he wished to deal with. As to capital, it was obvious that the Company, when introducing their Bill, looked too far ahead. They had now reduced the amount from £300,000 to £150,000; but for many of the items in the list presented to the Committee on the previous day, no order had been given, and it would be for the Committee to consider how much was really essential to carry on the undertaking. The London County Council wished to secure that the granting of the powers should not enhance the value of the concern when it came to be sold. The Local Government Board suggested that a clause should be inserted on the lines of section 47 of the East London Water-Works Act, 1900—"Provided that, in the event of the purchase of the Company's undertaking by a public body, the Company shall not be entitled to make any claim in respect of advantages conferred by the Bill, except for the actual amount of capital expended. This was effected by the East London clause: "If the undertaking of the Company is purchased within seven years from the passing of this Act, otherwise than by agreement, by any public body or trustees, nothing in this Act shall authorize the Company to bring into account, or to make any claim in respect of, any advantages conferred on them by, or resulting from, the passing of this Act." He asked for this clause, which had been introduced into the Staines Reservoirs Acts of 1898 and 1901 and the Metropolis Water Act, 1899. Mr. Littler had drafted a clause he objected to entirely. He could imagine a nice point of law being raised as to what was the "like effect" of an Act not passed.

Lord BALCARRES: Will you give your views as to the difference between the three and the seven years?

Mr. BALFOUR BROWNE said that if the Government Bill were rejected this year, it might take two or three years to introduce another; and therefore seven years should be fixed to cover eventualities.

Mr. FITZGERALD said the Surrey County Council had no desire whatever to embarrass the Kent Company during the short period which would apparently elapse before they passed into the hands of a Water Trust; but they desired to safeguard their position, and see that the water supply of the county of Surrey was not, by the changes which would take place, made available for the supply of the inhabitants of the county of London. Surrey did not wish to be involved in any of the expensive schemes for the water supply of London, and this purpose might be thwarted if the water-bearing strata of the county were affected by the present Bill. He proposed a clause which provided that no water taken by the Company under the Act (or under their agreement of 1895) should be used for supplying outside the county of Surrey, except to the places already supplied.

Mr. DU CANE thought there could be no doubt as to the need of water for Tatsfield. The present was practically their only opportunity of obtaining it.

Mr. WEDDERBURN, for the various Local Authorities, said that the Committee had stated that, in their view, the Bill was merely a temporary measure; and he asked that words should be introduced into the title and elsewhere to that effect. It was all-important that the Company should be tied down to a temporary measure, as the Local Government Board advised. He contended, with regard to the additional capital asked for, that not one of the things listed was really urgent, and asked that the Committee should specify the objects for which it was required. He resisted altogether any extension of area. The Bill was temporary; but the extension would be permanent.

Mr. LITTLER said that the matters dealt with were questions of clause; and it would be better to consider them as they arose.

The CHAIRMAN: The Committee consider the preamble has been proved, and are in favour of the extension of the area, under the special circumstances.

Mr. DU CANE: Do I understand you give the extension to Tatsfield, which the Godstone District Council ask for?

The CHAIRMAN: Yes. It seems to the Committee that the authorities in that part are in a very exceptional position, and this is a good opportunity for them to get the water from a convenient place.

The clause as suggested by the County Council of Surrey was then considered.

Mr. LITTLER said he failed to see how such a clause could be effectively carried out. How was the Surrey water to be distinguished from the Kent water?

After some discussion,

The CHAIRMAN said the Committee were against the clause, and also against altering the title, as proposed by Mr. Wedderburn.

Mr. WEDDERBURN then asked if the Committee were going to reduce the capital.

The CHAIRMAN: No.

Mr. WEDDERBURN: Then there is the clause for supplying water in bulk beyond authorized limits.

Mr. LITTLER: We shall cut out that clause now that Tatsfield is included.

Mr. BOYCE, for the Local Government Board, asked if the Committee were prepared to allocate the £150,000 to definite works.

The CHAIRMAN: Yes.

After some further discussion, the clause with regard to value was agreed to, as follows: "Provided that, in the event of the purchase of the Company's undertaking by a public body before the 6th of June, 1906, the Company shall not be entitled to make any claim in respect of advantages conferred by this Act, except for the actual amount of capital expended."

Mr. DU CANE asked that Tatsfield should not be subjected to the high-service charge.

The CHAIRMAN: The Committee are against you.

Mr. LITTLER then urged that the opposition of the Local Authorities represented by Mr. Wedderburn was vexatious, and asked for costs against them.

Mr. WEDDERBURN contended that the Committee not being complete (Mr. Trevelyan being the absentee), it was not within their power to charge the costs against the Local Authorities.

Mr. LITTLER said this was not the case; but the point was not insisted upon.

Mr. WEDDERBURN further contended that, as the Authorities' case had not been heard with regard to the price for water or the hardness of it, it could not be urged that they should bear the costs.

The CHAIRMAN: We cannot accede to the application made by the promoters with regard to costs, and for this reason only—that we have not heard the opponents' case or their evidence.

The remaining clauses were then read and agreed to; and the Bill was ordered to be reported to the House.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, March 25.

(*Before Mr. Justice* KEKEWICH.)

Attorney-General (on the Relation of the Rickmansworth Gas Company) v. Rickmansworth Urban District Council.

To day an application was made for an injunction to restrain the defendants from applying any part of the general district fund, or any other public fund or rate under their control, to the payments of any costs or expenses incurred or to be incurred in relation to the opposition by them of a Bill now being promoted by the plaintiffs, until they had obtained the consent of the owners and ratepayers of the district to such opposition, and otherwise complied with the provisions of section 4 of the Borough Funds Act, 1872. The scope of the Bill has already been indicated in our columns. Objection had been taken by the District Council to several of its provisions, and a petition had been presented against it. They urged that though the demand for gas was increasing, it was mainly in the urban district; and they claimed that, in the interest of that district, provision should be made for furnishing a proper supply. This, they said, was not being done in the best possible manner by the Bill. They also objected to the extension of the limits as to the rural districts, unless such extension should be guaranteed not to lead to an enhancement of the price of gas within the urban district. The Council alleged that the clauses of the Bill relating to capital and profits were objectionable features of the measure. Under them the share capital was to be raised from £17,500 to £100,000, and the borrowing powers from £3933 to £33,000; and the Council submitted that no justification could be shown for so large a capital, which amounted to approximately twice the rateable value of the proposed area of supply. Objection was also raised to the conditions under which the Company's old shares are to be provided for by the issue of ordinary stock of the new capital. The plaintiffs complained that, in opposing their Bill, with the intention of charging the expenses upon the rates, without the consent of the ratepayers, which had not been obtained, they were acting *ultra vires*; and in asking for an injunction they relied upon sections 2, 4, 8, and 10, of the Borough Funds Act, 1872.

Mr. WARRINGTON, K.C., and Mr. R. J. PARKER appeared for the plaintiffs, and cited *Attorney General v. Corporation of Swansea** and *Attorney-General v. Corporation of Brecon*† in support of the motion.

Mr. S. O. BUCKMASTER appeared for the District Council, and contended that the Bill was one which ought to be opposed, which only the Council could oppose, and which it was their duty to oppose; that the Court should not intervene in a matter which was placed in the discretion of the Local Government Board by section 3 of the Local Authorities (Expenses) Act, 1887; and that the Council were not a "corporation" within the decisions referred to.

At the close of the arguments,

Mr. Justice KEKEWICH expressed the opinion that the injunction should be granted. He said it was of vast public importance that district councils should be kept within their proper jurisdiction. They had very large powers, which were exercised for the benefit of the public; but if they showed a disposition to go beyond them, it was equally for the benefit of the public that they should be restrained. It was unnecessary to go into the law of the matter. The two cases cited on behalf of the plaintiffs stated it plainly. The sole question was whether the present defendants were exceeding their common-law powers; it being admitted that they had not complied with section 4 of the Act of 1872, so that they could not say that their constituents had authorized them to oppose the Gas Company's Bill. Having referred to certain paragraphs in the petition, his Lordship said it appeared to him therefrom that the Council had constituted themselves a sort of representative body for the district. This was entirely a false position. The Council was not constituted for this purpose. Such a body had no right of supervision over public interests as a whole, and

* See "JOURNAL," Vol. LXXI., pp. 655, 723.
† See "Michael and Will," 5th Ed., pp. 683, 4.

enjoyed no act of suzerainty. The paragraphs to which he had referred were directed to show that the acts proposed by the Gas Company were not for the benefit of the public, and that it was not desirable in the public interests that the Bill should go through. It seemed to him that, in putting all these reasons forward, the Council were going far beyond their duties. They were not protecting their own rights and privileges, but were endeavouring to protect the public in matters with which they were not concerned. Reference had been made to section 3 of the Local Authorities (Expenses) Act, 1887, which provided that "expenses paid by any local authority whose accounts are subject to audit by a District Auditor shall not be disallowed by that Auditor if they have been sanctioned by the Local Government Board." It was suggested in a note to that section contained in Mr. Glen's work on "The Law of Public Health" that this enactment "allows them to determine beforehand that the expenditure shall not be disallowed;" and it was argued that the Court should not anticipate the exercise of this discretion. In the present case, the Local Government Board had not been applied to; and it might be that these expenses, some of which had not been incurred, might be submitted to them. The Act of 1887 had constituted the Board sole arbitrators in this respect; and it was argued that the Court would do wrong to intervene. But it seemed to him to be going far beyond the intention of the Act to say that because the Board might, when applied to, allow some or all of this expenditure, therefore the Court must not intervene to prevent it being incurred when the Board had not been applied to. He could not think that because there was an authority which, when applied to, might enable them to do that which at present they could not do, therefore the Court ought to hold its hand. An injunction must therefore go—not to prevent the Council from opposing the Bill, but to prevent them from so opposing it as to throw the expenses on the rates until the consent of the ratepayers had been obtained.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, March 20.

(*Before* LORD CHIEF JUSTICE *and Justices* DARLING *and* CHANNELL.)

Pritty v. Child—A Water-Finder's Mistake.

This was an appeal by the defendant, a miller, residing at Capel St. Mary, from a judgment given for the plaintiff by his Honour Judge Eardley Wilmot, at the Ipswich County Court, in an action for damages arising out of a statement made by the defendant upon which the plaintiff acted to her detriment. The plaintiff had a house and about an acre of land in Suffolk, and the claim set forth that for the sum of 25s. the defendant agreed to point out on the plaintiff's premises a spot where water could be obtained, and that he did point to a particular spot and say that water would be found at a depth of 25 to 30 feet. Relying on this, the plaintiff sunk a well to that depth, but found no water; and she claimed damages from the defendant. The Judge found that the defendant had made the statement recklessly, and that he knew the plaintiff would act upon it. He based his finding of recklessness on the fact that the defendant stated in evidence that he had no means of knowing the depth of the water; and he gave judgment for the plaintiff for £42.*

Mr. RAWLINSON, K.C., and Mr. W. R. ELLISTON appeared for the appellant; Mr. A. H. POYSER and Mr. E. T. PICKARD represented the respondent.

Mr. RAWLINSON, in support of the appeal, dealt at some length with the circumstances, and submitted that the defendant only contracted to use his best endeavours in the work he had undertaken, and that there was no evidence of recklessness. Mr. Child never professed to find water at any particular depth, but only to state whether or not it was to be met with at an easy distance.

The LORD CHIEF JUSTICE said the County Court Judge found that Mr. Child had made a definite statement of fact that he could find water at a depth of 25 to 30 feet. That statement was reckless.

Mr. RAWLINSON submitted that there was no evidence of such recklessness as would amount to negligence.

Replying to Mr. Justice Darling, Mr. RAWLINSON said they must take the statement made by Mr. Child as an expression of opinion; and he contended that they must read into the statement the words, "in my opinion."

Justice DARLING: If he had only said that, the County Court Judge could not have found against him.

Mr. RAWLINSON said the County Court Judge misunderstood the statement of the defendant, in which he said he could not tell, and never professed to tell, the exact depth at which water could be found. He said he could tell within an "easy distance."

Mr. POYSER argued that the decision of the County Court Judge was good. He did not think his learned friend had brought out to the full extent the very definite issue of fact raised as to what took place. When Mr. Child went to see Miss Pritty's house, he did not merely say water would be found at a certain spot, but went further, and stated that it would be found at a depth of from 25 to 30 feet, where there would be a strong spring of running water. Defendant was not a professional man; and if he gave advice without qualification, it was negligence. If a man made a reckless statement to a person who had a right to rely, and who did rely, upon it, he was liable for the damages that naturally followed from the statement. The defendant owed the plaintiff a duty in regard to the matter.

The LORD CHIEF JUSTICE, in giving judgment, said that, sitting as a Judge of First Instance, he should have hesitated to come to the conclusion that the defendant did more than make the statement in question as a matter of opinion; but the Judge had found otherwise. A broad distinction had to be drawn between the case of an ordinary person, who owed no duty to anybody, and the duty imposed upon one employed to advise for remuneration. Where a reckless statement of fact, intended to be acted upon, was made to another by a person who owed a duty to that other to exercise reasonable care, it was actionable if it caused damage. Taking the findings into consideration, he did not see how anybody could hold that the statement in the present case had no relation to the duty which the defendant owed to the plaintiff. Being there as her water finder, he was bound not to make a reckless statement of facts which he knew was to be acted upon. The appeal would be dismissed, with costs.

Justice DARLING concurred. Drawing attention to the correspondence which had taken place, he said the defendant did not say that he would give his opinion, but that he would be able to point out a spot where a good supply of water was obtainable. If the County Court Judge was right in finding that this statement was made to the plaintiff, he thought he was justified in coming to the conclusion that it was made recklessly, in the sense that the person making it did not care whether it was true or not when he made it to a person to whom he had a duty to tell the truth, and the real state of his knowledge.

Justice CHANNELL also concurred, and said that reckless statements that did not amount to fraud could not be made a cause of action unless there was a distinct duty arising out of the contract. Here there was such duty.

The appeal was accordingly dismissed.

* See "JOURNAL," Vol. LXXVIII., p. 1322.

COLLIERY WORKINGS UNDER RESERVOIRS.

Mr. Justice Swinfen Eady has recently had before him, in the Chancery Division of the High Court of Justice, a special case stated by Mr. A. H. Leech, the Umpire in an Arbitration which had been proceeded with up to a certain point between the Corporation of Wigan, as owners of the water-works, and the Wigan Cannel Colliery, Limited, to settle the amount of compensation (if any) which the Corporation were to pay to the Company in order to avoid their working a particular seam of coal, called the Elms four-feet mine, underneath the reservoir and water-works of the Corporation. The case stated that, by the Wigan Water-Works Act, 1853, the Corporation, as the Local Board of Health, were empowered to lay down and maintain water-works, with all necessary reservoirs and other works; and for this purpose, in 1856, certain land was conveyed to them by Viscount Cardwell. There was no conveyance of minerals under the land to the Corporation. In 1875, the Viscount demised to certain lessees all the minerals under Elms Farm, with power to work them; but the lease provided "that the lessees, &c., shall not use, divert, foul, dam up, or interfere in any way whatsoever with the water contained in, or flowing to or from, the reservoir, and also that the lessees, &c., shall not in any way injure, obstruct, interfere with, or in any way prejudicially affect the said reservoir or tank, nor the conduit or pipes conveying water to or from the same, and running through the said Elms Farm, nor any of the other water-works belonging to, or under the control and authority of, the Board of Health." On July 29, 1899, a notice was served upon the Corporation by the Company of their intention to work the mine under the reservoir. By a memorandum dated April 20, 1900, signed by the agents of the Corporation and the Company, after reciting that the Corporation were desirous of acquiring the Elms four-feet mine (the mine in question), it was agreed that the amount of compensation to be paid by the Corporation to the Company in respect of the Company's interest (if any) in the mine in question be left to two arbitrators. The arbitrators met, and failed to agree; and an umpire was appointed. The questions submitted for the opinion of the Court were: (1) Whether, upon the true construction of the lease of 1875, the damage, injury, obstruction, and interference referred to in the above proviso, was damage, &c., caused by surface operations only, or whether the same included damage, &c., caused by underground as well as surface operations. (2) If upon the true construction of the lease of 1875, the said damage included damage, &c., caused by underground as well as surface operations, then whether the Corporation were entitled to the benefit of, or to enforce, the proviso. (3) In what manner the respective answers of the Court to the questions (1) and (2) ought to be taken into account in assessing the amount of compensation to be awarded. (4) Whether, upon the true construction of the building leases (granted by the Viscount to other persons in 1870), and the lease of 1875, the Company were bound to leave any, and what, support for the land and buildings comprised in each building lease, by mines and minerals under land adjacent to the land comprised in such lease, or pay compensation for withdrawing such last-mentioned support. (5) In what manner the answer of the Court to question (4) ought to be taken into account in assessing the amount of compensation to be awarded. The case was argued at some length; and eventually his Lordship said he would take time to consider his judgment.

The Gaslight and Coke Company Fined for Deficient Illuminating Power.

At Bow Street, on the 24th ult., before Mr. Marsham, the Gaslight and Coke Company were summoned for supplying gas at one of their testing-stations of less illuminating power than prescribed by the Company's Act of 1876. Mr. Jesse W. Godfrey supported the summons on behalf of the London County Council; Mr. Robinson defended. Mr. Godfrey said that on Jan. 17, according to the Examiner's report, the illuminating power of the gas supplied by the Company was of 15·46 (instead of 16) candle power. Mr. Robinson did not dispute the facts, but raised a technical objection to the summons on the ground that the proceedings had not been instituted within one month of the date of the Gas Examiner's report, as required by the Act. Mr. Marsham, however, overruled the objection. Mr. Robinson said the maximum fine for such a slight offence was only 40s.; and he hoped the Magistrate would make it as small as possible. Mr. Marsham: I expect your Company would feel insulted if I fined them less than 40s. Mr. Robinson: Not at all, I assure you. The Defendants were ordered to pay 40s. fine, and 23s. costs.

From Monday to Thursday last week, John Wright and Eagle Range, Limited, and Messrs. Fletcher, Russell, and Co., Limited, exhibited their gas stoves, fires, &c., in the lesser Colston Hall, Bristol; free lectures being given each day by Miss L. G. Silvester.

MISCELLANEOUS NEWS.

GAS LEGISLATION FOR THE METROPOLIS.

The County Council and the Commercial and South Metropolitan Bills.

At the Meeting of the London County Council last Tuesday—Mr. J. M'DOUGALL in the chair—the Parliamentary Committee presented a report on the progress of the Bills promoted by the Commercial and South Metropolitan Gas Companies, both of which, as our readers are aware, have recently been passed by a Select Committee of the House of Commons presided over by Mr. Eugene Wason. It was as follows:—

Commercial Gas Bill.

The principal objects which the Bill sought to effect were: (1) To reduce the standard illuminating power of gas supplied by the Company from 16 to 15 candles on Jan. 1, 1903, and to 14 candles on Jan. 1, 1907, the present standard price being reduced to 3s. 5d. in the first case and to 3s. 4d. in the second; (2) to sanction the raising of £500,000 of additional capital; (3) to enable the Company to convert their existing ordinary and debenture stock to stock of other nominal amounts; and (4) to deal with the method of testing gas. A petition was presented against the Bill on behalf of the Council, pointing out that the proposed reduction in the standard price was not commensurate with the contemplated reduction in illuminating power, that the amount of additional capital sought to be raised was excessive and unnecessary, and that the proposal in the Bill with regard to the testing of gas should not be sanctioned by Parliament. Counsel appeared in support of the Council's petition, and evidence was given by the Comptroller, the Chemist, and Professor Vivian B. Lewes (who appeared for the Council with the consent of the Corporation of the City of London). It was pointed out before the Select Committee that the Council was not objecting on principle to the proposal to enable the Company to convert their stocks, inasmuch as Parliament had already given a similar power to the South Metropolitan Gas Company, but that the Council thought the effect of the conversion, so far as concerned dividends, should be clearly shown in the accounts of the Company. In the course of the proceedings, the Company intimated that they would be prepared to reduce the standard price to 3s. 4d. instead of 3s. 5d. for 15-candle gas, and to 3s. 3d. instead of 3s. 4d. for gas of 14-candle power; that they would reduce the new capital proposed from £500,000 to £400,000; and that they would omit the clause with regard to the method of testing gas. The Council's views being substantially met by these amendments, the petition against the Bill was withdrawn, and the Select Committee passed the Bill subject to these amendments.

South Metropolitan Gas Bill.

The South Metropolitan Gas Bill, as deposited, sought to extend the time for any transfer to the Company of the area supplied by the Gaslight and Coke Company south of the Thames. By the South Metropolitan Gas Act, 1901, the two Companies were authorized to enter into agreements for the transfer of the area, subject to a proviso that no such agreement should have effect unless the Gaslight and Coke Company should, in the present session, obtain power to raise additional capital under an Act which should define the manner in which the money to be paid to that Company for such area should be applied. This Bill, however, sought to remove the obligation placed by Parliament on the Gaslight and Coke Company to promote legislation in the present session as a condition upon which the transfer might be effected, and to leave it open to the Company to introduce a Bill when it thought fit. The Bill also sought to abolish the Gas Referees, and to apply to the Company the provisions of the Gas-Works Clauses Act, 1871, dealing with the testing of gas; and it further sought to enable the Company to acquire certain lands, including lands belonging to the Council, and to manufacture gas on lands in the immediate neighbourhood of property of the Council. On behalf of the Council, it was considered that the two first-mentioned proposals were highly objectionable; and the promoters ultimately withdrew from the Bill before it went before the Select Committee the clauses dealing with the extension of the time within which an agreement for the southern area of the Gaslight and Coke Company might be carried into effect. Although this result must be considered satisfactory, we desire to point out that, owing to the Gaslight and Coke Company not having introduced a Bill in the present session, as indicated by Parliament last year, there is no opportunity of obtaining in a Bill of the Company this year any alteration, in the public interest, of the terms on which they now supply consumers. A further point of objection on behalf of the Council was met by the promoters undertaking to insert a clause in the Bill to provide that the amount of capital to be raised under their Act of 1901 should include the premiums to be obtained on the sale thereof. Before the Select Committee, Counsel appeared on the Council's petition against the Bill, and strongly opposed the clauses in the Bill to alter the law as to testing; and in the result, the Select Committee decided that this part of the Bill should be struck out. With regard to the provisions dealing with the acquisition of land, we were able to settle clauses with the promoters, and also clauses in respect of the widening of various streets, preventing the stopping up of a footpath on the bank of the river, and as to other matters.

Mr. W. C. JOHNSON moved the reception of the report, with the exception of the paragraph dealing with the Commercial Gas Bill. He said there were two points on which he thought the Council ought to press the Committee for further concessions from the Company, the first being with reference to the standard price of gas. It would be within the recollection of the Council that the Select Committee of the House of Commons two years ago recommended the reduction of the illuminating power of gas from 16 to 14 candles. The Commercial Gas Company had accepted this recommendation, and had gone down to 3s. 3d. per 1000 cubic feet for 14-candle power; but he hoped the Parliamentary Committee would endeavour to get a further reduction of at least 2d., and possibly 3d., in the price, in accordance with the recommendations of that Committee. But there was a more serious question even than that, one which would press very heavily on poor consumers in the East-end of London—the district the Company supplied; and that was with reference to the burner the Company provided freely in consequence of the reduction in the illuminating power of the gas. They had consented to supply a "suitable" burner; this was the word in their Bill. The Council had had some experience with regard to a similar state of affairs in connection with the South Metropolitan Company's reduction in the illuminating power. They also offered to provide "suitable" burners; and in practice they furnished burners of two descriptions—one a governed, and the other an ungoverned burner. Both were satisfactory so far as illuminating power went; but by one the consumption of gas was nearly double that by the other. At 3 inches pressure, the governed burner passed only 5 cubic feet of gas per hour; whereas the ungoverned burner passed 9 cubic feet. If the Commercial Company were going to supply the latter description of burner to the consumers, their gas bills of necessity would be very much heavier than if they supplied the governed burner; and he was very anxious that the Committee should make an endeavour, when the Bill was before the Committee of the House of Lords, to secure that words should be introduced into the Bill to specify that the "suitable" burner should be a governed burner. The matter was one which had been before the Public Control Committee, in consequence of the difficulties with the South Metropolitan Gas Company in the south of London, who, it might be remembered, insisted upon charging 6d. each for these burners, whereas the Council contended that they ought to have supplied them free. In order that the poor consumers in East London should not have to pay for these governed burners, and should not have to burn twice the quantity of gas—at any rate, gas in the proportion of 9 to 5—which they otherwise would, he moved that the paragraph he had been dealing with be not received.

Mr. W. J. SQUIRES (Chairman of the Public Control Committee) seconded the motion, because he considered it was for the benefit of the whole community that the Company should be treated in the same way as the South Metropolitan Company.

Mr. A. J. SHEPHEARD expressed the hope that the paragraph would not be taken back; the points raised being very technical, and very troublesome to deal with. The Council had obtained a compromise which was to a considerable extent in their favour, and went practically the whole way they wished to go. They had got the price reduced by 1d., and the amount of extra capital brought down from £500,000 to £400,000; and, moreover, they had obtained the omission of the clause for altering the method of testing the gas. These were three very considerable modifications in the proposals of the Bill, and on the strength of them the Council had withdrawn their petition. He submitted that it would put the Committee in a very invidious position if the Council instructed them to go to work again on the Bill in the other House; and therefore he thought they should pause before they sent the report back.

Mr. A. L. LEON said, as the Commercial Company was the one which supplied with gas the district he represented, he hoped the Council would not leave the burner to be settled by the Company, but say what should be the proper burner to use with gas of a different candle power. He trusted the Council would adopt Mr. Johnson's amendment.

Mr. T. M'KINNON WOOD suggested that the Chairman of the Public Control Committee should attend the Parliamentary Committee, and put these matters before them, so that they might be properly discussed, and the position considered.

On a show of hands, the amendment was negatived, and the report received.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company presented at the half-yearly general meeting last Saturday, they stated that the total amount standing to the credit of the profit and loss account at the close of the past year was £38,341, out of which they recommended the payment of dividends at the rates of 10 and 7½ per cent. per annum on the respective shares. They added that the works and appliances of the Company, including the distributing plant, had been maintained in the highest possible state of efficiency. The accounts accompanying the report showed that the revenue from the sale of gas in the six months covered by them was £131,500, which was brought up to £148,336 by the meter-rents. Residuals produced £25,440; and the total receipts were £174,148. The expenditure on the manufacture of gas was £100,604, of which £80,315 was for coal, cannel, and oil; on distribution, £16,077; and on management, £4687—the total expenses being £137,492, leaving a balance of £36,656 to go to the net revenue account. The amount carried forward was £8897; but as £7212 was paid for interest on the loan capital and for commission, there was only £1685 to add to the balance on the revenue account, which made up the £38,341 mentioned at the outset. The quantity of gas produced from the 53,608 tons of coal, 1435 tons of cannel, and 944,110 gallons of oil used was 797,532,000 cubic feet, of which 728,197,000 cubic feet were sold and 736,032,000 cubic feet accounted for. The estimated quantities of residual products in the half year were: Coke, 66,397 chaldrons; breeze, 6303 chaldrons; tar, 641,564 gallons; and ammoniacal liquor, 1,843,719 gallons.

COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

The Directors of the Commercial Gas Company have issued their report for the second six months of 1901 (with the accounts) in anticipation of the meeting of the proprietors on Thursday.

It is pointed out that the revenue account shows a net profit for the half year of £50,932. Deducting therefrom £6349 for preferential charges, there remains a sum of £44,583 available for dividend on the ordinary stock of the Company—recommended at the rate of 12 per cent. per annum on the old stock, and 9 per cent. on the new. The most meagre reference is made to the Company's Bill, which passed the Committee stage in the House of Commons on the 14th ult. The report merely announces that the measure was reported to the House, and that "the subsequent stages of the Bill will be proceeded with in due course."

The accounts show that during the half year £18,588 of debenture stock had been issued, and £5913 of premiums had been received in respect of it. The Company were therefore getting to the end of their

capital resources—£28,125 of new stock and a similar amount of 4½ per cent. debenture stock only remaining out of the authorized capital of £1,130,000. The six months' expenditure on capital account amounted to £13,574—viz., £5491 for buildings, plant, &c.; £2059 for mains and services; £1010 for meters; £1817 for stoves; and £3197 for automatic meters and fittings (less £2293 written off for depreciation). The reserve fund, at Dec. 31, amounted to £30,253; and the insurance fund, to £28,652.

Revenue Account.

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£99,189 1 9		
Salaries of Engineer and officers at works	2,511 10 0		
Wages (carbonizing)	19,174 3 1		
Purification—including £3877 for labour	8,143 6 11		
Repair and maintenance of works and plant, materials, and labour, less £479 received for old materials	20,254 0 11	£149,272	2 8
Distribution of gas—			
Salaries and wages of officers and rental clerks	£2,152 18 0		
Repair, maintenance, and renewal of mains and services, material, and labour	2,094 1 7		
Repair and renewal of meters	1,962 9 1		
" " " " stoves	2,365 3 3		
" " " " automatic meters and fittings	2,292 12 0	10,867	3 11
Public lamps—lighting and repairing		2,602	9 11
Rent, rates, and taxes		8,678	2 11
Management—			
Directors' allowance	£1,250 0 0		
Company's auditors	75 0 0		
Salaries of secretary, accountant, and clerks	1,220 2 1		
Collectors' salaries and commission	1,635 11 5		
Automatic meter collection	537 3 3		
Stationery and printing	743 14 0		
General charges	657 1 3	6,118	12 0
Bad debts		1,080	7 10
Discounts and allowances		2,163	17 1
Law and parliamentary charges		498	13 5
Superannuations and allowances		226	8 6
Official officers		83	11 7
Total expenditure		£181,591	9 10
Balance carried to net revenue account		50,932	5 7
		£232,523	15 5

Receipts.

Sale of gas—			
Common gas per meter at 2s. 8d. per 1000 feet	£168,855 13 11		
Public lighting and under contracts, common gas	8,914 7 8	£177,770	1 7
Rental—			
Meter	£2,671 13 9		
Stove	2,493 6 3		
Automatic meter and fittings	4,251 7 9		
Incandescent mantle maintenance	41 6 2	9,457	13 11
Residual products—			
Coke, less £3726 for labour	£28,378 0 0		
Breeze, less £690 for labour	814 9 5		
Tar	7,501 14 2		
Ammoniacal liquor and sulphate of ammonia	8,407 13 3	45,101	16 10
Miscellaneous receipts—			
Rent receivable	£168 18 1		
Transfer fees	25 5 0	194	3 1
Total receipts		£232,523	15 5

Net Revenue Account.

Balance on June 30, 1901	£37,754 11 6	
Amount brought from reserve fund	6,579 16 0	£44,334 7 6
Less amount of dividend paid for half year ended June 30, 1901		44,334 7 6
Balance from revenue account		50,932 5 7
		£50,932 5 7
Interest on debenture stock		£5,721 7 3
Interest balance		627 11 10
Balance available for dividend, carried to balance-sheet		44,583 6 6
		£50,932 5 7

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals.

Description.	In Store June 30, 1901.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1901.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	29,587	102,027	97,857	451	33,306
Cannel	3,281	..	..	50	3,231
Total	32,868	102,027	97,857	501	36,537
Oil—gallons	187,515	1,460,774	1,359,600	..	288,689

Statement of Residual Products.

Description.	In Store June 30, 1901.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1901.
Coke—tons	2,160	59,937	15,527	43,441	3,129
Breeze—tons	1,784	11,053	..	11,337	1,500
Tar—gallons	416,331	1,201,078	..	920,584	696,825
Ammoniacal liquor—butts	4,574	31,612	28,078	..	8,108
Sulphate of ammonia—tons	76	1,004	..	964	116

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,452,006	55,571	1,277,335	1,355,506	4,893

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Meeting of the Company was held on Wednesday last, at the London Offices, No. 11, George Yard, Lombard Street—Mr. J. Horsley Palmer in the chair.

The Secretary (Mr. H. B. Chamberlain) first read the notice convening the meeting, and then the report of the Directors for the six months ending Dec. 31, together with the accounts of the Norwich station as required by the Company's Act. In the report, it was stated that the available profit was £25,263, after deducting the following sums, and adding £10,290 from the Hull reserve fund and £1338 from the Potteries reserve fund; the parliamentary interest at these stations not having been realized by the respective amounts. The deductions (omitting shillings and pence) were as follows: Trowbridge excess profit, £91; income-tax, £1600; Hull debenture interest, £988; Norwich debenture interest, £894; Potteries debenture interest, £376; Trowbridge debenture interest, £164; and interest on debenture stock, £983—making a total of £5099. The gas-rental at the Hull station showed an increase of £1741, as compared with that of the corresponding period of 1900; the price of gas having been the same at each period—viz., 2s. per 1000 cubic feet. Coke exhibited a decrease of £5978; tar and tar distilling, £1242; and ammoniacal liquor and sulphate, £280. Coal cost 17s. per ton, as against 15s. 2d. per ton; and coke realized 13s. per ton, as compared with 16s. 11d. per ton. The gas sent out was 548,815,518 cubic feet, as against 531,837,339 feet—an increase of 16,978,179 feet, equal to 3·19 per cent. Of this quantity, 50,210,000 cubic feet was supplied in bulk to the Corporation for the supply of the Old Town. The profit realized was £10,290 less than the parliamentary interest; and this sum had been taken from the reserve fund, leaving a balance of £21,207. In regard to the Norwich station, the gas-rental showed an increase of £1574, as compared with that of the corresponding period of 1900; the price of gas having been the same—viz., 3s. 6d. per 1000 cubic feet. Coke exhibited a decrease of £641; and tar and ammoniacal liquor an increase of £301. Coal cost 18s. 8d. per ton, as against 21s. 10d. per ton; and coke realized 9s. 4d. per chaldron, as against 10s. 11d. per chaldron. The gas sent out was 199,515,000 cubic feet, as against 189,179,000 feet—an increase of 10,336,000 feet, equal to 5·46 per cent. The profit realized was £1717 less than the parliamentary interest. At the Potteries station, the gas-rental showed an increase of £338 over the corresponding period of 1900; the price of gas having been the same—viz., 2s. 8d., per 1000 cubic feet. Coke exhibited a decrease of £2101; and tar, ammoniacal liquor, and sulphate, a decrease of £475. Coal cost 13s. 5d. per ton, against 15s. 10d. per ton. Coke realized 7s. 2d. per ton, as against 11s. 11d. per ton. The gas sent out was 192,628,000 cubic feet, as against 187,524,000 feet—an increase of 5,104,000 feet, equal to 2·72 per cent. The profit realized was £1338 less than the parliamentary interest. This sum had been taken from the reserve fund, leaving a balance of £18,518. At Trowbridge, the gas-rental showed an increase of £164 over the corresponding period of 1900, the price of gas having been the same—viz., 3s. 6d. per 1000 cubic feet, with discounts. The residual products realized £73 more. Coal cost 16s. 11d. per ton, against 19s. 2d.; and coke realized 13s. 7d. per ton, against 16s. 4d. per ton. The gas sent out was 30,960,900 cubic feet, as against 29,958,763 feet—an increase of 1,002,137 feet, equal to 0·34 per cent. The profit realized was £91 in excess of the parliamentary interest. This sum had been invested in Consols, making the reserve fund £1618. At Holywell, the rental showed a slight increase; and the residual products realized £24 more. The profit was £260. In conclusion, the report stated that the general result was that the available profit, added to the previous balance of profit and loss, amounted to £54,580. From this the Directors recommended a dividend at the rate of 10 per cent. per annum clear of income-tax. This would amount to £23,000, and leave a balance of £31,580.

The Chairman, in moving the adoption of the report and accounts, said he should not detain the shareholders very long with many remarks on the working of the half year; but there were a few which, he thought, would be of interest. He would begin with the general accounts of the Company. The profit, as would be observed, was £25,300, against £24,000 in the corresponding half of 1900; so that they were really £1300 to the good on the working of the half year. If they added to this the sum of £983, which was the first payment on their debenture stock, it would be seen they were really £2300 better, compared with the second half of 1900. This was so far thoroughly satisfactory. It would also be noticed that they were carrying forward a larger balance, amounting to £31,580; and he hoped no grasping shareholder would turn round on the Directors and say: "You ought to have paid us a bonus," because, as he (the Chairman) had frequently pointed out, they wanted in the business more working capital. For several years, there had been a deficiency of working capital; and the Directors looked to the amount carried forward every half year to keep the stations going in that respect. But those of the shareholders who had studied these matters would naturally say: "You have made a considerable profit this half year; but you have only done so at the expense of drawing out of the Hull reserve fund the amount of £10,290." This was very easily explained, because, as he thought he mentioned in the remarks he made at the last meeting, the Directors did not, about eighteen months ago,

when the coal famine (as it was called) took place, raise the price of gas at Hull to the amount which other companies in the neighbourhood (and throughout England) did. The Directors were perfectly aware that, for at least two or three half years, they would have to draw upon the large reserve fund they had accumulated there. It was simply a matter of business, and they looked upon it as a matter of business not to unduly press their consumers at Hull with a high price for gas; and the shareholders might depend upon it that in the long-run the Company would benefit by such action. They had now worked out the whole of the stock of dear coal; and he therefore expected the normal profit at Hull would soon be shown. The increase in the consumption of gas at Hull had been very slight. There had been an absolute reduction in the amount used in the district which belonged to the Corporation, and to which the Company supplied gas in bulk. Therefore what increase had taken place had been in their own district, outside the town of Kingston-upon-Hull. While speaking of Hull, he might mention that there was a rather interesting little matter which the Directors had been negotiating during the half year. At some distance from Hull, there was a small and rapidly increasing villa-built district called Cottingham. It had been lighted by gas by a small local Company, although it was within the British Company's district. But it was situated on the extreme boundary; and for many years it was not worth while for the British Company to go to the expense of extending their mains to the district. The consequence was the people of the village, with the full cognizance of the Directors, built a small gas-works themselves some 25 or 30 years ago. It had now come to this, that—Hull having extended in the direction of Cottingham—the Directors gave notice of their intention to exercise their own powers of laying gas-mains in the village. But the Board also thought it would be very unfair that the shareholders of the small Company there should suffer by being throttled by a great Company like the British. The Directors had therefore come to an agreement—on, he thought, fair terms to both sides—to purchase the Cottingham Company's works. He believed this would be (he would not say immediately, but eventually) of advantage to the British Company; and he felt certain that, as Hull extended to the Cottingham district, they might look to getting a fair return for the money expended in purchasing the works there. With regard to Norwich, he had very little to say. It would be remembered that they appointed a new Manager there (Mr. Thomas Glover), who was carrying on the work of the late Manager to the satisfaction of the Directors. He had also in contemplation the remodelling of the somewhat old works, by putting down new purifiers and making other changes in the plant, which the Directors hoped would lead to some improvement in the working. It was also proposed to reduce the price of gas from April 1. The increase in the sale of gas there was the most satisfactory of any of their stations—it was about 5½ per cent. Their Manager had been very active in regard to increasing the use of slot meters and placing stoves; and the work generally at Norwich was going on in a satisfactory manner. At the Potteries, they had, of course, a considerable amount of work going on. It would be remembered that, at the last meeting, he told the shareholders the Directors were obliged, owing to the sinking of the ground, in consequence of the undermining of the works by coal and iron workings, to purchase a fresh site. They had erected there a new tank and gasholder; and they had hoped to have had it in use last winter. But unfortunately, owing to circumstances over which the Directors had no control, a bridge over which the gas-mains were to be laid was not built by a local Company in accordance with the terms of their contract; and the result was they had not been able to use the new gasholder as had been hoped. The Directors had spent about £20,000 of capital there; and they were at the present moment making a siding from the North Staffordshire Railway direct into the works. They hoped before the shareholders met again, a good deal of this work would be in operation. He was sorry to say their Manager at the Potteries station (Mr. J. R. Heath), who was a very excellent man, had been seriously ill; and he was sure they all sympathized with him, and trusted that he would soon be able to resume his work. With regard to Trowbridge, which was only a small station, it was satisfactory this half year to notice that more than the parliamentary profits had been earned; and so they had been able to put a small sum to reserve. It was a small item certainly; but it was the result of the improved working produced by the new plant which the Directors advisedly laid down last year. Trowbridge was now a model little works, and things were going on there very satisfactorily The Directors, he added, had agreed to make a small reduction in price to the consumers at Trowbridge. One other thing he wished to mention was with regard to the raising of fresh capital. In accordance with an arrangement made between the Directors and the members of the Hull Corporation, whom the Board met when they were discussing the Bill, it was agreed that, when the Company issued any further capital for Hull in the shape of mortgage debentures, the people of Hull should be given an opportunity of subscribing for them. The shareholders would know that hitherto the Company had been rather conservative in their action with regard to debentures. They looked upon them as a remarkably safe and good security; and therefore they thought the shareholders should have the first opportunity of benefiting by taking up some of them. On this occasion, the Directors had promised the benefit to Hull; and it was their intention to carry out the promise by going down to Hull, and seeing the bankers about offering the debentures during the current half year. He thought it only right to mention this, in case it came to the ears of the shareholders, who might think they had been treated unfairly. If the people of Hull did not intend, or did not wish, to take up the debentures (but he rather thought that they would), they would then be offered to the shareholders.

Mr. F. WILKIN seconded the motion.

Mr. HARRIS inquired how many debentures the Directors proposed to issue, and the rate.

The CHAIRMAN replied £60,000, and that the Directors intended to issue them at as low a rate of interest as possible. It would be to the interest of the ordinary shareholders to do so. It was, of course, difficult to fix the rate until the Directors had seen the bankers at Hull, and had ascertained what they thought the local public would take them at. He hoped they would be issued at 3½ per cent., seeing that they were almost the first charge on the station.

The resolution was unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. R. S. GARDINER, a dividend at the rate of 20s. per share (clear of income tax) for the half year was declared, payable on April 9.

Mr. STEVENS, in proposing a vote of thanks to the Chairman and Directors, remarked that he was glad to hear the Chairman's explanation respecting the Hull figures. He must say that, at first sight, they looked a little unpleasant.

Mr. HARRIS seconded the proposal, which was unanimously passed.

The officers and staffs, both in London and at the stations, were also heartily thanked, on the motion of Mr. GARDINER, seconded by General CORRIE.

The CHAIRMAN and the SECRETARY having responded, the proceedings terminated.

SAN PAULO GAS COMPANY, LIMITED.

A Remarkable Report on Low-Power Gas and Incandescent Enterprise.

The Annual Meeting of this Company was held yesterday week, at Winchester House, E.C.—Mr. D. M. Fox in the chair.

The SECRETARY (Mr. G. H. Rogers) having read the notice convening the meeting, the Directors' report and the accounts were taken as read.

The CHAIRMAN said it gave the Directors great pleasure to meet the shareholders with such a highly satisfactory report and statement of accounts, inasmuch as the forecast he ventured to make a year ago, as to the continued prosperity of the Company, had been fully borne out, and their financial position was certainly as strong as, if not stronger than, ever it was. The sale of gas, as compared with 1900, showed an increase of 5 per cent. The number of public lamps had been increased by 223; and the number of consumers by 453. The total receipts in San Paulo amounted to £99,102, or an increase of £9283. The public lighting showed an advance of £1250; private lighting, of £1024; and stoves, &c., which was a new item, accounted for £778—making together a total increase on the sale of gas of £3052. Then, in regard to residuals, there was an increase on the sale of coke of £5118, and on the sale of tar of £1070—making £6188. This large addition on the residual products—gratifying as it was, and creditable to the local management—was mainly owing to the high price of fuel in San Paulo, caused by the boom in 1900; and it could scarcely be expected to last. The Directors would not be surprised if it dropped as coal receded in price. The total expenditure in San Paulo was £69,747; being an increase of £4750. Under the heading of "manufacture of gas," there was an advance of £2500 in cost of coal, which was almost counterbalanced, or practically so, by the decrease of £2510 on maintenance and renewals. The increased expenditure on account of coal was caused by the high price consequent on the contract of 1900; but all the dear coal had been consumed, and coal at lower rates had now come into use. The real increase in the outlay was to be found under the heading of distribution; and it was due entirely to the liberal policy pursued by the Board and the Manager out in San Paulo towards the consumers; this being necessitated by the fact that, if the Company were to hold their own, they were bound to assist in the substitution of inferior fittings (which unfortunately were found to be almost generally in use) by fittings and appliances of modern type. He was bound to say there must have been, and was, a sad slackness, or lack of enterprise and energy, in this department in former years. The net profit for the year was £25,279; and it appeared to be £1447 less than it was in 1900. But it would be borne in mind that, whereas in that year the actual exchange difference was carried to the profit and loss account, this year, with the approval of the Auditors, the difference had been carried direct to a special exchange suspense account. As to the balance-sheet, the expenditure on capital account (£4526) was accounted for by the orders received from the Government for fresh lamps, mains, and other things of that kind. Another item in the balance-sheet which would be noticed was investments £10,354. This was practically a nest-egg the Directors had thought it wise to put by; and the sum had been invested in securities which had not depreciated but had appreciated since their purchase. The shareholders would expect him to refer to the effect of the competition of the Electric Light and Power Company, and to the modifications the Directors had considered it advisable to obtain in the contract of 1897. As yet, the competition had not materially affected the prosperity of the Company; but it must be borne in mind that the Electric Light and Power Company had only during the past year completed their works on the River Tieté and their transformer mains to the city, which enabled them to generate and supply electric current by water power. Although no doubt the object of the Company was primarily for the electric working of some 40 or 50 miles of tramways in the city and suburbs, and the supply of power on an important scale, still it was certain that every effort would be made, and was being made, by them to develop lighting by electricity. Realizing this, the Directors on the part of the Company had not only made every effort to improve and popularize the use of gas by every means in their power, but they had approached the Government with the view of strengthening the Company's position; and to do this they had no doubt had to make several important concessions. As this was to an extent a technical matter, he read a memorandum which had been drawn up, at the request of the Directors, by the Consulting Engineer (Mr. A. F. Phillips). It was as follows:—

When the Company renewed the contract with the Government in 1897, the incandescent gas-burner not having assumed the practical form it has to-day, the illuminating power of the gas was fixed at 17 candles, the same standard as in the old contract—the Government of San Paulo wisely considering it advisable in a hot country to obtain the greatest amount of light with the least consumption of gas. Since then a great development of incandescent gas lighting has taken place all over the world. At first we were impeded in introducing it into San Paulo because of patent rights existing there. These we bought up, and pushed the system with energy, showing the consumers that they could obtain five times the light with a reduced consumption of gas and less heat. Stores have been opened for the sale and exhibition of the burners, and a staff of fitters employed changing the

burners at the private consumers' houses and instructing them in their use. The result is that to-day practically all the private lighting is with the incandescent gas-burners; and we have shown our customers that the light is more powerful and more economical than that furnished by our friendly rivals the Electric Light Company.

With this change in the system of lighting, rich gas is no longer required. . . . The Directors—considering it would be to the mutual advantage of the Government and the Company if the illuminating power of the gas could be reduced to 14 candles, and the street lighting transformed to incandescent gas-burners—entered into negotiations with the Government for carrying this out, with the result that a modification of the contract has been signed, which only awaits the ratification of the Senate, whereby the illuminating power of the gas will be reduced from 17 to 14 candles, the price from 170 reis to 140 reis per cubic metre, and the guaranteed public consumption is raised from one million to a million-and-a-half cubic metres per annum.

The advantages the city will derive from this change are enormous. Take the public lighting. There are to-day in San Paulo 3600 public lamps, giving an illuminating power of (say) 39,600 candles. By the transformation to be effected under the terms of the new contract, these same lamps will have an illuminating power of 193,000 candles; while with the reduced price of the gas the cost will be reduced by £5214 per annum. The city will have nearly five times the light, and pay 20 per cent. less for it. The private consumers will obtain the same light from their incandescent burners, and have the benefit of the gas at a lower price.

It may be wondered what benefit the Company will derive from this reduction in illuminating power accompanied with so considerable a reduction in the price of the gas, which will so materially reduce the revenue. We expect to effect an economy in the cost of producing the gas by discontinuing the use of cannel, of from 8 to 10 reis per cubic metre. The other 20 reis of the 30 reis reduction is a present to the city. The Directors believe this is a wise policy. It will strengthen the gas-works to meet the competition of the electric light. It will tend to increase the use of gas for lighting; and with gas at such a reasonable price, there is every reason to look for considerable increase in the use of gas for cooking and heating—a branch of the business which is now receiving the Company's most careful attention. We have every confidence that, with the exercise of care, the improvements we are making in the retort-settings, and economy in the administration of the Company's business, our position and dividend will be maintained. The Government of San Paulo has always faithfully carried out the stipulations of the contract entered into with the Company; and the Directors are pleased to recognize this by making such a considerable sacrifice of revenue to enable the authorities to render the lighting of the City of San Paulo as brilliant as any city in the world.

The Directors, the Chairman continued, had done their best to look after the interests of the shareholders. The Government and the public gained immensely by the competition; and who, he asked, could blame them if they took full advantage of the position? He was quite sure that no unfair advantage would be taken of the Company; and the contracts would be readily adhered to, so long as those who were at the head of affairs in San Paulo remained in power. Having made a handsome acknowledgment of the services of the Company's Manager (Mr. Richard Gray), and of the staff, the Chairman referred to the future, and said he thought he might venture to predict that there would be a continuance of the 8 per cent. dividend. As to a proposed issue of debentures, he said they might require a small amount—from £10,000 to £20,000—and, if they were issued, the shareholders would have the preference. He concluded by proposing the adoption of the report and accounts.

Major H. N. Webb seconded the motion.

Mr. Fowler, in the course of a few remarks, urged the necessity of building up the reserve fund as much as possible; and he asked how the £10,354 to which the Chairman had referred had been invested. He also expressed his satisfaction with the accounts.

Mr. F. A. Edwards commented on the fact that nothing special was written off for depreciation.

The Chairman, in reply, pointed out that the reserve fund stood at £38,153; and in the report the Directors proposed to transfer to reserve an additional £5000. The investments were in English securities, which were quoted on the London Stock Exchange. With regard to depreciation, the policy of the Board was to maintain the works in thoroughly good order; and the money spent on repairs and renewals was practically equivalent to depreciation.

On the motion of the Chairman, seconded by Mr. John Barker, a final dividend of 4 per cent. (making 8 per cent. for the year) was declared.

The retiring Director (Mr. Fox) and the Auditors (Messrs. Cash, Stone, and Co.) having been re-elected, the usual complimentary votes were passed.

ILFORD GAS COMPANY.

The High-Pressure System of Gas Lighting.

The Half-Yearly Meeting of this Company was held at Ilford on the 20th ult.—Mr. William Ashmole, the Chairman, presiding.

The report and accounts having been presented,

The Chairman, in moving their adoption, said the Board congratulated the proprietors upon the continued prosperity of the Company; the increase in the quantity of gas sold, as compared with the corresponding period of the previous year, being upwards of 21 per cent. This was greatly due to the additional number of gas-stoves and slot-meters in use. Residual products, however, still remained at a low price. The gas industry, as a whole, continued to flourish, in spite of the keen competition from the electric light in certain districts. Electric current, at anything like its present price, rendered the light a luxury, and likely only to be adopted to any large extent in such places as the West-end of London and in the chief suburban shops, though the Ilford District Council were offering terms to consumers for installing the system which it was admitted could only be carried out at a considerable loss to the ratepayers. The section of the public lighting in Ilford which had been "electrified" was costing very much more in proportion than was paid for the incandescent gas lighting; and he thought the proprietors would agree that the electric light now supplied could not be regarded in any respect as an improvement on the incandescent gas system, on the point of either economy or efficiency. The Ilford Company was one of the first to establish an installation of high-pressure gas, and the Directors expected by next winter to place this highly efficient and up-to-date system of lighting at the disposal of the chief shops in the town. They had also adopted a maintenance system for incandescent burners, by which it was hoped to facilitate the general use of this economical and brilliant method of lighting. The Company had also reason to congratulate themselves upon the fact that they had emerged from a period of depression, and, unlike many other gas companies, had been able to continue to pay the usual dividends without encroaching upon the reserve fund.

The report and accounts were adopted, and a dividend was declared at the rate of 6 per cent. per annum on the "A" and "C" stocks, and 4½ per cent. on the "B" stock.

The usual votes of thanks brought the meeting to a close.

EXMOUTH GAS COMPANY.

The Heavy Loss Through Leakage.

The Annual Meeting of the Exmouth Gas Company was held last Wednesday, Mr. J. Palmer presiding. In their report, the Directors stated that the balance of profit and loss account amounted to £2239, out of which they recommended payment of the usual dividends amounting to £640, and leaving £1559 to be carried forward to next year's account. A shareholder pointed out that the profit showed a falling off as compared with the previous year. Mr. H. A. Willey, the Company's Consulting Engineer, said the diminution of profit was due to three causes. The first was that the cost of coal to the Company was nearly 15 per cent. more than under the contract for 1900. Secondly, the large leakage of gas to which he referred at the last half-yearly meeting, which was primarily due to the sewage operations carried out in the town, whereby the pipe-joints had been injured, and over 20 per cent. of the gas made was lost. The Company had been advised by one of the leading experts of the day as to their position in this respect, and the interests of the shareholders had been adequately protected. Proof of default was difficult; and the Directors considered it better to accept this prejudice rather than enter upon costly and acrimonious litigation with the authorities, with whom their relations had always been friendly, and they had been strengthened in the course by the fact that the abnormal leakage had now been stopped. Every precaution would be taken in future to prevent its recurrence. The third cause was, in his opinion, the fact that the Directors had somewhat prematurely reduced the price of gas, being over-anxious to exhibit a spirit of liberality to the consumers and to grant them every concession possible. The effect of the whole was that they had had to supplement the balance of profit by dipping a little into the amount carried forward from year to year as undivided profit. It was estimated that by reason of the leakage of gas having been stopped, and that very favourable coal contracts had been negotiated for the current year, the result of the present year's working would be as successful and as profitable as of any in the history of the undertaking. Mr. Willey went on to refer to the Company's business in sulphate of ammonia, and said that because of the want of scientific training the use of sulphate was to a very great extent neglected in England, and its chief value was for export. If farmers were trained in its use, not only would they reap great advantages, but considerable development would take place in the sale of this important bye-product. The report and statement of accounts were adopted, and the dividends were authorized to be paid.

TORQUAY GAS COMPANY.

The Annual Meeting of this Company was held on Monday of last week—Mr. W. H. Kitson in the chair.

In their report, the Directors stated that the total receipts on the revenue account for the year ended the 31st of December had been £33,015, and the expenditure £26,455; leaving a balance of £6560 to be carried to the profit and loss account. They recommended that the full year's dividend should be declared. There had been a gratifying increase in the sale of gas.

The Chairman, in moving the adoption of the report, said that in 1890 they had a record year; but the past year had established a further record. Their receipts from the sale of gas amounted to £23,309 against the previous year's record of £21,510; the increase being £1969—7½ million cubic feet more gas being sold. This progress had been steady. In 1891 their receipts for gas amounted to £18,650; but they had gone on steadily rising. It was remarkable that the greatest increase had come concurrently with extension of electric lighting. With regard to the future, it was by the use of gas for cooking and heating that they must expect to extend their business. The number of new stoves let out during the year was 475, making 1585 in use. Small cookers and grillers were now let to prepayment customers entirely free of charge. The prepayment system had proved a valuable aid to the Company. Since the adoption of the system, the receipts had increased steadily by an average amount of £500; but in the past year they went up by £900. The additional meters supplied numbered 350, making a total of 1365. This new business fully made up for the loss sustained by the competition of the electric light. The Company had entered into arrangements to undertake the maintenance of burners at a nominal sum of 7½d. each per quarter, including renewal of the mantles. In conclusion, he thanked the staff for the efficient way in which they had carried out their duties.

Mr. H. A. Willey, in seconding the motion, referred to one or two matters affecting the gas industry as a whole which had transpired since their last meeting. Subsequently, dealing with the question of the proximity of gas-works to cities and towns, which had now reached an acute stage in Torquay, Mr. Willey stated that it had been said that "gas-works were health resorts." He, however, would not go so far as that, but there was no question, on high scientific authority, that the existence of such gas-works close to cities and towns had, in neutralizing and sterilizing the active principles of disease, prevented on numberless occasions the ravages of epidemics. He warmly congratulated the Company on the fact that, notwithstanding electric light competition

in their midst, the use of gas was now steadily increasing to an extent indicated by the fact that during the past twelve months more than 7½ million cubic feet were sold in Torquay in excess of that of the previous year. He testified to the ability displayed by the Company's Engineer (Mr. R. Beynon).

The report was adopted.

An extraordinary general meeting followed, at which the Directors were empowered to sell 400 £10 shares; being a further proportion of the capital authorized by the Torquay Gas Act.

COMBATING ELECTRICITY IN NORTH MIDDLESEX.

An Effective Diagram.

Readers of the "JOURNAL" do not require to be told that one of the most doughty champions of gas as an economical illuminating agent as compared with electricity is Mr. C. H. Rutter, Engineer and Manager of the North Middlesex Gas Company. His effective leaflet, entitled "Facts and Figures," in regard to the cost of private and public lighting by the two illuminants, which has been already noticed in our columns, has undergone revision, and it now demonstrates to the ratepayers of Finchley, Hendon, and Mill Hill more strikingly than ever that gas is far cheaper than electricity—that, in fact, light which costs 6d. to produce by the latter can be obtained from gas, used in conjunction with incandescent mantles, for ¾d. In the domain of public lighting, the difference is remarkable. A 16-candle power electric lamp for street lighting will not consume less than 250 units per annum for all-night lighting, and, exclusive of maintenance and cleaning, will cost, at 6d. per unit, £6 10s., and give a light of 16 candles. A No. 4 Welsbach incandescent burner will consume 19,350 cubic feet of gas per annum for an equal period of lighting, and will cost, at 4s. per 1000 cubic feet, £3 17s. 6d., and give a light of 80 candles. Consequently, to obtain an equal light with electricity, it would be necessary to spend £32 10s., against £3 17s. 6d. for gas. The economy of gas is still more apparent when it is burned in a self-intensifying gas-lamp; the light of 320 candles costing 0·48d. for gas, against 7·5d. for electricity. The comparative cost of the two systems is also shown by an ingenious diagram devised by Mr. Rutter, and effectively printed in red and black on a card which he is distributing in the district. The light obtained from 6d. worth of electricity is represented by a black spot ¼ inch in diameter; the same sum expended for gas consumed with an incandescent burner producing light represented by a red spot three times the size. On the other side of the card, 6d. worth of light produced by various methods is shown by red and black lines. There is not very much difference between electric incandescent lamps at 4½d., 5d., and 6d. per unit, and the ordinary flat-flame burner with gas at 4s. per 1000 cubic feet. Argand gas-burners show slightly better results; but the oil-lamp, with oil at 8d. per gallon, and the regenerative gas-lamp are more than twice as good as the argand. The incandescent gas-burner, however, is enormously superior to the latter—its line being 2 inches long, compared with ⅞ inch in the other two cases. The self-intensifying gas-burner is infinitely better than this—its line being 3¾ inches in length. In his leaflet and card, Mr. Rutter demonstrates in a very striking way the truth of his dictum that "electricity is for those to whom expense is no object," but that "gas means economy." The ratepayers and consumers of his district will do well to profit by the instruction he gives them.

Leamington Priors Gas Company.—The half-yearly general meeting of this Company was held last Tuesday, when it was reported that the Company had had a successful six months' working, the sales of gas having increased 5 per cent. The cost of coal being now lower, the Company had reduced the price of gas 1d. per 1000 cubic feet from the Christmas quarter. The usual dividends of 10 per cent. on the "A," and 7 per cent. on the "B" shares were agreed to.

Sales of Stock and Shares.—Last Tuesday, Messrs. Hollis and Webb sold 50 shares of £10 each in the Wakefield Gas Company, at £18 10s. and £18 15s. per share. The next day, Mr. Walker Walmsley offered for sale, under instructions of the Yeadon Water Company, £2000 of new "B" stock; being a portion of the additional capital of £28,000 authorized by the Yeadon Water-Works Act, 1889. It was put up in 200 lots of £10 each, and was sold at an average of £13 18s. per lot.

A Fen Water Supply Controversy and its Solution.—The Sleaford Rural District Council have just decided upon a novel method of settling a controversy as to whether the water supply of Great Hale should be conveyed a distance of nearly three miles into the Fens at a cost of £600. The Hale Parish Council and residents in the village have strongly opposed the application; while Mr. C. E. Harris, a local farmer, pleaded warmly on behalf of himself and his fellow-ratepayers. It was resolved, on the suggestion of Mr. R. Burrows (the Chairman), to take a "rating vote" of the parish; and the side paying the largest aggregate amount in rates are to have their wishes gratified.

The Quality of Huddersfield Gas.—At the last monthly meeting of the Huddersfield Borough Council, Dr. F. W. Robinson, who is a new member of that body, moved the following resolution: "That, having regard to the injurious effects of sulphur compounds in coal gas, the Gas Committee be instructed to adopt the most efficient means to eliminate these bodies from our gas supply." He reviewed at some length the history of gas legislation in reference to the quantity of sulphur compounds allowed in gas, and reminded the Council that their Gas Engineer (Mr. E. A. Harman) had, in a recent publication, advanced a series of arguments to prove that the sulphur in gas was useful and beneficial. He (Dr. Robinson) considered these arguments were altogether fallacious. He thought it was more important that the exact composition of gas should be stated than that so much should be made of its exact illuminating power. Alderman Sugden defended the Gas Committee, who, he said, tried in every possible way to produce pure gas. After a long discussion, the matter was referred to the Committee.

LAMPLIGHTERS' COMPLAINTS AT NEWCASTLE.

It is stated that a satisfactory settlement has been arrived at in the matter of the Newcastle lamplighters' grievances, to which we referred in our issue of the 11th ult. (p. 654). At a meeting of the men last Tuesday, Mr. Peter Milne, the local delegate of the Amalgamated Labour Union, said he, along with Mr. Sharp and Mr. Forbester, the representatives of the lamplighters, had been received by Mr. Lewis, one of the officials of the Company. They laid their case before him, and, he thought, had secured concessions that would be considered satisfactory. The men had complained that they were now forced to hand in their daily reports between 8.30 and 9.30 a.m., instead of between 8.30 and 10.30, according to the legal agreement drawn up between the Company and the men. In regard to this, Mr. Lewis said he was not aware of the new arrangement, and was quite willing that the old conditions should be observed. He also agreed that one man could bring to the office as many reports from other lamplighters as he desired, if they were handed in before 10.30. In regard to the men being blamed for the breakage of mantles when their destruction was the result of circumstances over which they had no control, Mr. Lewis stated that it was found that there were from 20 to 60 per cent. more mantles used in that city than in other large towns. He was prepared to institute a bonus system in reference to this matter, so that the men would be further encouraged in attending to the interests of the Gas Company. In regard to the dismissal of a man, the deputation were informed that he could not be reinstated as a lamplighter, but would be found employment in another department under the Company. Mr. Milne's report was considered very satisfactory by the men, who passed a resolution thanking Mr. Lewis for the considerate manner in which he had received the deputation.

ANOTHER ACCIDENT AT THE TRURO GAS-WORKS.

Damage to a Gasholder.

The proverb which tells us that misfortunes never come singly was verified at the Truro Gas-Works on the evening of yesterday (Monday) week. In consequence, it is supposed, of the explosion on the previous Friday, an account of which was given in the "JOURNAL" last week (p. 781), one of the cables of the rope-guided gasholder became damaged, and at about a quarter to six, during the prevalence of a very heavy gale of wind, it snapped. Men were at once set to work to make a temporary holdfast for the night; and while they were engaged on this task two more cables yielded to the strain upon them, and the holder, which contained about 130,000 cubic feet of gas, suddenly fell over in the direction of some adjacent cottages. The wind was blowing from the city, and the large volume of liberated gas was carried over the cottages below and on towards the river. Additional retorts were brought into use, and by slightly reducing the pressure for a few hours a sufficient supply for the demands of the city was obtained from another holder. Two men who were working immediately under the damaged holder had a rather narrow escape, but no one was injured. The damage, it is estimated, will probably amount to about £500. The two accidents will, it is believed, involve an outlay of about £1000. Fortunately the explosion is covered by insurance.

HARWICH GAS-WORKS EXTENSION.

Board of Trade Inquiry.

At the Guildhall, Harwich, last Tuesday, Mr. INGRAM J. WALKER, one of the Inspectors of the Board of Trade, held an inquiry relative to an application made to them by the Harwich Gas Company for authority to erect a gasholder on land on the Bathside Estate, at Harwich. In the Order as originally drafted, the Company applied for sanction not only to put up a gasholder, but to manufacture gas on the site they had selected. The Corporation, while at first opposing, ultimately withdrew their opposition when an amended Order was lodged by the Company in February, in which they undertook to use the ground for storage purposes only.

Mr. C. C. HUTCHINSON appeared in support of the application; and Mr. C. E. JONES opposed, on behalf of owners of, and residents on, the Bathside Estate.

Mr. HUTCHINSON, in stating his case, said the Harwich Gas Company sought to acquire land for the purpose of extending their works, and also to obtain further capital. The Company had been in existence since 1854. Additional powers were obtained under a Provisional Order granted in 1874, whereby their limits were defined to be Harwich, Dovercourt, and Ramsey. The capital was £24,000; and they were entitled to a maximum dividend of 10 per cent. The illuminating power of the gas was fixed at 14 candles, and the price at a maximum of 7s. 1d. per 1000 cubic feet. The population had grown very considerably since 1871, and while in that year there were 6000 people in Harwich, in 1901 there were upwards of 10,000. In the first-named year, the Company had 259 consumers; while last year the number had risen to 759. In 1891, the Company made 12 million cubic feet of gas; and in 1901, as much as 24 millions—an increase of 100 per cent. It was very important that the Company should have sufficient storage accommodation for their maximum daily make, which had increased from 65,000 cubic feet in 1890 to 103,000 cubic feet in 1901. The usual practice in connection with storage was to adjust the holding capacity to the maximum make of one day. The Company had been going on under difficulties for some time; and, though about £1500 had recently been spent on new retorts, the existing works were not extensive. They had one holder capable of containing 40,000 cubic feet of gas, and another which held 10,000 feet. The total of 50,000 feet was only half-a-day's make; and because of the inability of the Company to store more, they had been obliged to force hot gas into the mains. This was objectionable, for the reason that a considerable leakage resulted, while the consumer suffered because of a variation in the

pressure. There was some intention on the part of the Company at one time to ask for powers to increase their works; but they had abandoned the idea of manufacturing gas on the proposed site, though it would have been to the advantage of the individual. The piece of land upon which they desired to erect the gasholder had been purchased, and they sought the authority of the Board of Trade to build the holder. It was a remarkable thing that, no matter where gas-works were erected, houses were always put up in the neighbourhood; but he contended that the gasholder would not be of such detriment to the surrounding property as the slaughter-houses which literally abounded in the Bathside district. He urged that the opposition to the Company's application resulted from misapprehension, many of the residents being misled. There was no smell or nuisance arising from a gasholder, and he hoped there was nothing, under the circumstances, which would warrant the Board of Trade in saying the Order should not be sanctioned.

Mr. *J. T. Jolliffe*, Engineer to the Ipswich Gas Company, was called, and supported the statements made by Counsel. He said the Harwich Company were unable to meet the present demand owing to the want of storage accommodation, and it was on this account that they could not supply gas to Parkeston, where there was a population of 2000. They tried several sites, but the only suitable one was that selected. The gasholder would not deteriorate the value of property; in proof of which he stated that houses close to the Ipswich Gas-Works let at from £20 to £25 a year. He recommended the erection of a holder in which the Company could store 150,000 cubic feet.

Replying to Mr. JONES, witness insisted that there was no nuisance from a gasholder; and he would not accept the suggestion that the houses outside the gas-works at Ipswich let for only £14. Witness characterized as ridiculous the notion that the houses would deteriorate in value owing to their proximity to the gasholder.

Mr. *H. J. W. Jervis*, one of the Directors of the Company, gave evidence of a similar character. He said the Company were unable to obtain any other site, as the owners refused to sell.

In cross-examination by Mr. JONES, witness said he knew the Corporation of Harwich had obtained provisional powers for electric lighting; but he was not aware they had become vested in the Gas Company. They had advisedly made no move, and could not produce it at a cost at which they could compete with the Gas Company. It was elicited during further cross-examination that in the Bathside district there were seven slaughter-houses and an offensive sewage-tank.

Mr. *Hugh Turner*, of Ipswich, agreed with Counsel that the houses on the estate, which had a mud-bank in front, slaughter-houses behind, and a sewage-tank in the midst, would not deteriorate because of the erection of a gasholder.

Mr. *John Fenn*, auctioneer and estate agent, of Colchester, thought the site was an eligible one for a gasholder.

Mr. *G. Baines*, Secretary to the Company, said he obtained signatures to a memorial of 98 owners and occupiers on the Bathside Estate who did not mind the erection of the holder.

Mr. JONES raised a preliminary objection to the effect that there had been no publication of the amended Order, and that the Corporation had not obtained the consent of the Board of Trade to the withdrawal of their opposition to the draft Order. He urged the Inspector to consider the wishes of the owners and residents of Bathside, who strenuously opposed the application. He represented the owners of 171 houses and 200 occupiers, who prayed that the unsightly holder should not be erected. Though most of the opponents were poor people, they were entitled to have their views heard, and they looked to the Board of Trade to protect their interests. A number of them had invested the savings of a lifetime in property there, and earned their livelihood by letting their houses; but they feared the erection of the hideous structure proposed would prevent them doing this in the future, many of the residents having already threatened to leave the neighbourhood. He drew attention to the fact that the signatories of the petition presented by Mr. Baines lived on the outskirts of the Bathside district, and 300 yards from the site of the holder. He observed that it was open to the Company, if they could not obtain land by agreement, to get it compulsorily.

Alderman *H. G. Everard* said he was interested as a beneficiary and as a trustee in 13 houses in the Bathside district. He strongly objected to the holder, which would seriously depreciate the value of the property. No one would for choice live opposite a gasholder; and if it was erected, he would have either to reduce his rents or lose his tenants. He understood the value of property round the Ipswich Gas-Works had seriously diminished.

Mr. *Ernest Cann*, a member of the Harwich Town Council, and the owner and occupier of property on the Bathside Estate, believed that the holder would be unsightly and a nuisance. As a representative of the ward on the Council, he was able to say that by far the larger proportion of the inhabitants objected to the Company's proposal.

Mr. *E. E. Newton*, builder, who owns ten houses within 40 yards of the proposed holder, and Mrs. *Eliza Taylor*, who owns three houses, besides a piece of building land, at Bathside, objected to the holder on the same grounds as other witnesses.

Mr. *W. Wood*, of the firm of Messrs. Muskett and Co., auctioneers and valuers, of Wood Green, said that, from his experience at Hornsey, gasholders materially depreciated the value of adjacent property.

At the close of the inquiry, which lasted nearly six hours, the INSPECTOR said he would make his report in due course.

Increased Water Storage for Cardiff.—Messrs. J. A. B. Williams and C. H. Priestley have prepared a report on the necessity for increasing the storage capacity of the Cardiff Water-Works. In order, they state, to devote the Cantref and Beacons reservoirs entirely to the town supply, No. 3 reservoir must be made large enough to ensure the delivery of the full quantity of compensation water due to the entire drainage area of 10,400 acres. It must, therefore, have a capacity of 900 million gallons; and the total cost of the undertaking is estimated at £235,000. The Engineers disapprove of the suggestion of constructing another reservoir at Llanishen, but favour the raising of the present Llanishen and Lisvane embankments in order to increase the capacity of the reservoirs by 60 million gallons. The work is estimated to cost £9450.

ELECTRIC LIGHTING NOTES.

A Question of Site.

The Ilfracombe District Council found themselves in a little difficulty on Wednesday last, when called upon to approve a site selected by Edmundson's Electric Light Supply Company for the works which they propose to erect for the generation of electricity in the town. In the opinion of several members of the Council, and of persons outside who wrote to protest, the site chosen is very unsuitable. One member went so far as to say that the works would ruin the residential property in the neighbourhood, and another suggested that, when the facts became known, there would be many more complaints. The Council were, however, told by the Solicitor to the Company that the matter was settled so far as they were concerned, and that the question of site could not be reconsidered. Under these circumstances, the Council had to make the best of the matter and (by a majority of two votes) gave its approval to the proposal.

Town Councillors as Gas Shareholders.

The proposal to vest the management of the Barnstaple municipal electric light undertaking in a Committee consisting of the whole of the Town Council was again discussed at a meeting of that body last week. Alderman R. Ashton pointed out that some time ago all shareholders in the Gas Company were absolutely prohibited from voting on the electric lighting question; and he contended that if this decision was right, the present action of the Council must be wrong. They had no part in the selection of the tenders, but now gas shareholders were to be put on the Committee to bear the onus, if there was any. He should certainly keep away from meetings of the Committee. Mr. S. N. Petter said he should also object to serve on the Committee, because he could not vote, and also because the Council were only going in for part of the electric lighting scheme, instead of carrying out the scheme for lighting the whole town. Alderman J. D. Young said that the shareholders of the Gas Company were not responsible for anything which had been done hitherto; but now that the pecuniary matters in connection with the present work were dealt with, they should not be precluded from seeing that the work was carried out in the most economical way possible.

EAST LONDON WATER-WORKS ASSESSMENT.

Result of the Appeals.

Towards the close of last year, we reported the proceedings in connection with the appeals by the East London Water-Works Company to the County of London Sessions against the assessment of their works in various parishes. They were heard by Mr. Horace Avory, K.C., to whom they were remitted, who made the following awards, which, we learn from the appellants' Solicitors (Messrs. Bircham), have been adopted by the Court:—

Parish.	Assessment Committee's Figures.	Company's Figures.	Valuer's Award.
North Woolwich—			
Gross	£420	£206	£420
Rateable	350	185	361
St. Anne, Limehouse—			
Gross	3,094	805	1,277
Rateable	2,320	630	1,043
Hamlet of Ratcliffe—			
Gross	705	427	659
Rateable	529	331	531
St. Matthew, Bethnal Green—			
Gross	5,922	3,510	5,161
Rateable	4,465	2,753	4,151
St. George-in-the-East—			
Gross	1,954	1,000	1,560
Rateable	1,369	785	1,272
Mile End Old Town—			
Gross	4,743	3,150	4,675
Rateable	4,150	2,474	3,775
St. Leonard, Shoreditch—			
Gross	2,750	1,844	2,427
Rateable	2,000	1,452	1,903
St. John, Hackney—			
Gross	17,953	15,317	17,604
Rateable	14,961	11,924	13,971
St. Mary, Stratford, Bow—			
Gross	3,520	2,578	3,349
Rateable	2,640	2,008	2,589
Bromley St. Leonard—			
Gross	2,980	1,878	2,812
Rateable	2,235	1,470	2,268
All Saints, Poplar—			
Gross	2,989	1,676	2,688
Rateable	2,242	1,325	2,220

BRISTOL WATER-WORKS COMPANY.

The Annual Meeting of this Company was held on the 22nd ult., under the presidency of Mr. EDWARD BUSH.

The SECRETARY AND GENERAL MANAGER (Mr. A. J. Alexander) read the notice convening the meeting; and the report was taken as read. This stated that the revenue from water-rates for the year was £130,812; exceeding that of the previous year by £4716. The net sum shown by the revenue account (including £5931 brought forward) to be applicable for dividend on the ordinary capital was £55,304. Out of this, the Directors paid on Oct. 15 an intermediate dividend at the rate of 7½ per cent. per annum on the ordinary £25, £20, £6, and £4 10s. shares, and

5¾ per cent. on the 7 per cent. maximum consolidated ordinary stock—leaving a balance of £29,674 applicable for dividend on the ordinary capital. The Directors recommended the payment of final dividends at the same rates; leaving a balance of £3651 to be carried forward. The Corporation of Bristol were opposing the Company's Bill for improving the means of distributing the water from the filtered-water tanks at Barrow Gurney, which was unanimously approved by the shareholders at the meeting held on Feb. 1. The Corporation sought to vary rates authorized by the Company's previous Acts of Parliament, and protected by a clause introduced for that purpose, by agreement, into the Bristol Corporation (Boundary Extension) Act, 1897.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors had anticipated being able to pay a larger dividend—one of 8 per cent. instead of 7½; but there were satisfactory reasons why the Board could not do it. One of these reasons was the exceedingly dry season, which had forced them to pump right through the year, costing £1200 more than in the previous twelve months. Then, again, rates and taxes showed an increase of £2200. These were the principal reasons why, with an increased revenue, the dividend was not quite so much as they would have liked. The revenue was £130,000; and 10 per cent. of this (£13,400) went in rates and taxes. The expenditure was £39,000, of which one-third was swallowed up by rates and taxes. The receipts for the year were £4716 in excess of those of 1901. This showed how Bristol was increasing; and there was also the gratification of knowing that the expansion was still going ahead rapidly. In a few months, they would have the new engines at Blagdon. The Corporation were, as usual, opposing the Company's Bill in Parliament, notwithstanding that the city, in the last Extension Bill, had acceded to what it was now about to oppose. The Corporation, by deputation, had asked the Directors to lower the water-rate in some parishes, although the Company had taken so much trouble during the previous year, when so many cities were visited by drought, to ensure that Bristol was amply supplied. At no one time was there any danger of water becoming short. Indeed, the Company were prepared to face a drought of three or four months. Notwithstanding this excellent service, all the city authorities did was to come to the Board and want the water-rates to be lowered. Of course, the Directors told the deputation that this was out of the question; and the result was reported to the Corporation, who were now going to oppose the Company's Bill.

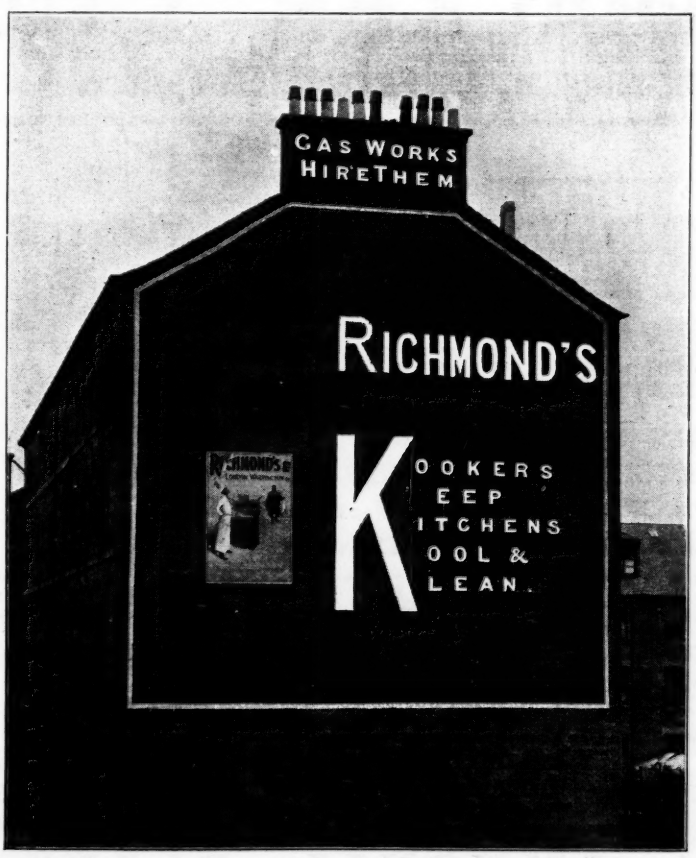
The report was adopted.

TEIGNMOUTH WATER SUPPLY.

A Meeting of the Teignmouth District Council was held on Friday week, to further consider the question of the proposed arrangement with the Torquay Corporation for a supply of water for the town. Since the last meeting, when it was resolved to give the Corporation fourteen days' notice to submit some fresh agreement, several letters had passed between the Clerk to the Council and the Town Clerk of Torquay. The Town Clerk pressed for the return of the original draft agreement, with any amendments which the Teignmouth Council desired to make, in order that the subject might be dealt with at the meeting of the Corporation to-day. The Town Clerk added that it was a mistake to suppose that there was any intention on the part of the Corporation to vary the original terms of the agreement. To this the Clerk to the Teignmouth Council replied that the draft agreement materially differed from the original understanding; and he pressed the Town Clerk to submit a new draft. Mr. Slocombe said he was of opinion that, as Torquay had not complied with the condition laid down at the last meeting, that an agreement embodying the terms of their original offer should be submitted within fourteen days, the negotiations should cease. If they opened further negotiations Teignmouth would be worse off than at present, and it would serve them right. Mr. Banbury pointed out that the great majority of the ratepayers were in favour of an honourable settlement with Torquay; and moved that a further letter be written to the Corporation stating that the only terms upon which they could treat further was the Corporation's original offer. It was pointed out that this was really a repetition of the resolution carried at the last meeting. The Rev. A. Cartwright then moved that, as the Torquay Corporation had declined to accede to the request of the Council, the offer should be considered as withdrawn. He contended that, as the great object had been to get water by the end of the present year, and this had failed, the Council ought to devote their attention to another supply with the view to an application to Parliament next session. The resolution was carried by five votes to three.

EXMOUTH DISTRICT COUNCIL AND THE WATER-WORKS.

The Exmouth District Council found themselves in a position of some difficulty last week in connection with the purchase of the water-works. March 24 was the day named in the Arbitrator's award for the completion of the purchase of the undertaking; but the Council were unable on that day to find the money. From statements made at a special meeting of the Council, it appears that the award was made on Dec. 21, and that on Jan. 22 tenders were invited for a loan of £71,000 to pay to the Water Company in accordance with the award. In the result, the Council entered into arrangements with the Prudential Assurance Company; and it was understood that the money would be forthcoming by March 20. It appeared, however, that certain formalities had to be observed which it was impossible to complete in the time stated, and that there would be a delay of about a fortnight. In these circumstances, Mr. Vine, the Solictor to the District Council, said he had an interview with Mr. Harris, the Solicitor to the Company, and suggested that the completion of the purchase should be deferred, and that the Council should pay interest at the rate of 4 per cent. on the purchase money until the purchase was actually made. Mr. Harris, however, wrote that on investigation he found that there were difficulties under the Act which would render



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this arrangement impracticable, and that if the Council were not prepared to pay the money by March 24, they would make default. Efforts to obtain a temporary advance of the money having failed, Mr. Harris was again seen, and the suggestion was made that the Company should make the new water-rate, but that its collection be deferred pending a settlement, and that if a month elapsed the Council should pay over to the Company one-third of the quarter's water-rate or 4 per cent. on the compound purchase money. It was promised that a meeting of the Directors should be held to consider these suggestions. The subject was debated with some acrimony by the Council—one or two of the members complaining of what they considered to be delay in proceeding with the negotiations for the loan. On the other hand, it was contended that the real cause of the difficulty was the long time taken by the Umpire in making his award. The Act authorizing the purchase was passed in July, 1900; but it was not until Dec. 21 last that the award was made. The meeting separated without coming to any decision, with the understanding that another meeting would be called to consider any fresh development of the case.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Greenock held a special meeting on Tuesday, to consider the proposed extensions at the Corporation gas-works at Inchgreen. A report by Mr. John West, of Manchester, was submitted, dealing with the working of West's stoking machinery and the coal-handling machinery of Messrs. Blake, Barclay, and Co. In this it was shown that, working by hand, 12 Klönne ovens require 42 men per 24 hours, and 18 Klönne ovens require 63 men per 24 hours; and that working with stoking machinery, 12 Klönne ovens require 24 men, and 18 ovens 30 men per 24 hours. The advantage of working by machinery is a saving of 33 men upon 18 ovens—or about 52 per cent. less labour. In Mr. West's opinion, if his original scheme of cannel breaking, elevating, and conveying machinery had been adopted, it would not have been necessary to handle the coal more than once, and there would have been a saving of 3·5d. per ton of coal carbonized. The saving by the use of stoking machinery would be 10·56d. per ton, which, added to the 3·5d., would make a total saving of 1s. 2·06d. per ton of coal. Upon the 32,657 tons of cannel and coal used in the works last year, the saving would have been £1913. He considers that the Corporation should carry out, with modifications, a scheme which was suggested in 1899, under which they would fit up the existing 18 Klönne ovens with stoking machinery, and extend the Klönne settings and stage-floor to the north end of the retort-house. Speaking to the report, Bailie J. H. Campbell said he thought the total cost of the proposed works might reach £25,000. The Sub-Committee submitted the suggestions as they had received them. They had not, Bailie Campbell said, interfered with the proposals; and if the scheme commended itself to the Corporation, it was for them now to say whether they would carry it out in its entirety. He moved that they approve of the report, and that Mr. West be asked to furnish an estimate of all the work which he recommended. Mr. Morison, in seconding, said he was convinced that the works were required, because during five months they had lost £1300 owing to the illuminating power of the gas having been 23 instead of 25 candles, which the coal they received was estimated to produce. To some extent, the lower illuminating power was due to the retorts which they were now proposing to renew. After discussion, the motion was adopted by a large majority.

In a leading article in the "Dumfries Standard" of last Saturday, written for the purpose—so stated—of enabling the community to make up their minds as to the comparative cost of lighting by gas and by electricity, the results obtained in the lighting of the Drill Hall at Paisley by the two lights are given. In the use of the incandescent electric method, 88 lamps of 32-candle power each were employed, giving a total light of 2796 candles, with a consumption of 10 units, and a cost of 3s. 4d. per hour. The outlay on the installation was £115, and the renewal of the lamps (once at 2s. 6d. each) cost £11. In the arc electric method, six 500-candle power lamps were employed, giving a total light of 3000 candles, with a consumption of 4 units, and a cost of 1s. 6d. per hour. The renewal of carbons (16 times at 3d. each) cost £2 10s. In the use of intensified incandescent gas, with Keith's compressors, six 1000-candle power clusters were employed, giving a total light of 6000 candles, with a consumption of 180 cubic feet of gas, at a cost of 7d. per hour. The cost of the installation was under £100, and of three renewals of mantles (54 at 8d. each) £1 16s. Comparing candle power with candle power, and taking 6000 candles as the standard for each, the cost, it was stated, worked out at 7½d. (21·4 units) per hour with incandescent electric lighting; at 3s. (8 units) per hour with arc electric lighting; and at 7d. per hour with intensified gas. These are the figures given; and the writer makes the saving by intensified gas to be 1½d. per hour as compared with incandescent electric, and 2s. 5d. per hour when compared with arc electric lighting. I do not understand the figures for incandescent electric lighting, because 21·4 units (the quantity assumed to be necessary to bring the light up to 6000 candles) at 4d. per unit would not be 7½d., but 7s. 6d. per hour. It is a pity that such a miscalculation should go unchecked, as it may be seen by members of other corporations, and may do harm, because, with a difference of only 1½d. per hour upon 6000 candles, the scale might be turned in favour of electricity. I suppose it is the miscalculation which is responsible for the writer, notwithstanding his admission that "the advantage is very decidedly with the gas," giving forth, as the views of the Editor, that, "so far as our opinion goes, it is in favour of electricity, and of its being undertaken by the Commissioners rather than by a company." But for this supposition, I should be inclined to say that the inconsistency which there is in the two conclusions was much more glaring than it is.

A supplied paragraph appears in the Aberdeen newspapers of Monday, in which the information is conveyed that a demonstration connected

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SULPHATE OF AMMONIA PLANTS.

with the Aberdeen local branch of the Gas-Workers and General Labourers' Union was held on the evening of Saturday last, and was largely attended. The chair was occupied by Mr. Walker, the Convener of the local Organizing Committee; and he was supported by Mr. W. Blackwood, Organizing Secretary for Scotland, and Mr. Pete Curran, General Organizer for Great Britain. It is added that "several points which the Union consider are in need of remedy were expounded; the question of wages coming in for a good deal of attention." Then, on Sunday afternoon, an open-air meeting was held at the foot of Market Street, and was addressed by Messrs. Curran and Blackwood; and, further, on Sunday evening, another largely attended meeting was held in the Trades Hall, when Messrs. Curran and Blackwood and others delivered addresses. This volcanic activity might seem to bode watchful times for the Aberdeen Corporation Gas Department; but, on reflection, it may be regarded as more theatrical than threatening. We are not told how many—or is it how few?—of the "large" gatherings were gas workers; and the season is scarcely propitious for gas workers showing much pertinacity to their employers, because they might suddenly find their services dispensed with.

I feel again drawn towards the anonymous correspondence in the newspapers regarding the Dundee Gas-Works. Another letter from the chief writer, who subscribes himself "More Light," appeared in the "Dundee Courier" on Monday. In it, in reply to a suggestion that he should become gas manager, he expresses his willingness to occupy any position where there is a handsome salary and nothing to do; and he goes on to say: "Suppose he made me Treasurer to the Gas Commissioners. There is less of odour and more of sanctity attached, and I could stay a-bed for a month or two at a time, provided always that I had made proper arrangements for the due payment of my salary and for the examination by me of the record of the gas-meter in my house. . . . Then, do you see, over and above all the salary, there is the absence of vulgarity and fumes and proximity to manufacture; a purely kid-gloved existence, highly paid, and with only one drawback—nothing to do. . . . I said that the two highest paid officials could be dispensed with, and I say it again; but the Analyst is not one of them, unfortunately for him. 'Lux,' in his eagerness to maintain the fair fame of the Manager, rakes in also that of the Analyst, without its ever having occurred to him that if the Manager ever had been such a paragon of perfection as he describes, there would have been no need for an Analyst, and therefore no Analyst. The Analyst has had no need to seek for sorrow or trouble; but, coming a stranger into such a kennel as the gas-works, he has had the usual stray dog's life. You see he was a stranger, and did not marry into the gas-works either. If he had even courted a gaffer's lassie, that gaffer would have been on his side; but he did not, and yet the gaffers all know that he knows his business and does it. But, all the same, if the Manager could have made an analysis, it would have saved an analyst's salary." There is more of this vituperative language, all in the same strain—depreciating the Manager and appreciating the Analyst. This latter is a new feature of the correspondence. It is a relief to know that there is someone in the Gas Department who does his duty, in the eyes of this terrible critic; but his championing of the Analyst, as against the Manager, must have the effect of throwing "more light" on his own identity, and may therefore reflect upon himself. Whoever he is, he writes with more than an outsider's knowledge; and it now appears as if with more than an outsider's interest. I recollect some years ago there was a persistent writer of anonymous letters regarding the use of air in the purifying of gas in Dundee. Those letters were of much the same stamp—in fact, bore a strong family resemblance to these. Probably the writer is one and the same person. Other letters have appeared during the week; but they are not worthy of notice.

I mentioned last week that the Town Council of Falkirk resolved to ask the General Manager of the North British Railway to furnish them with a copy of any correspondence which might have passed between him and Mr. H. Russell, with reference to the railway siding to the new gas-works at Thornhill. It has been reported to the Town Council this week that the General Manager of the Railway Company declined to furnish them with a copy, and referred them to Mr. Russell. After discussion, it was resolved to allow the matter to drop; and notice was given of a motion to the effect that in future all correspondence on Council business should be conducted through the Town Clerk.

The Edinburgh water supply is still giving cause for anxiety. During the past fourteen days, the quantity of water in store has been drawn upon by about a million gallons per day less than in the like period last year; yet the quantity of water in the reservoirs went down during the fortnight by 26 million gallons, which is nearly two days' supply. As compared with the quantity in store at this date last year, there is a decline of fourteen days' supply. Bearing in mind that it was necessary to restrict the supply last autumn, the outlook for the coming summer and autumn is not comforting. The rainfall between this and then will be the only means of escape from a water famine; and in this the present experience gives still less assurance—the published figures for the period from Jan. 1 till now being: At Glencorse, 1902, 4·14 inches; 1901, 6·67 inches; and 1900, 11·55 inches. At Gladhouse, 1902, 3·85 inches; 1901, 5·86 inches; and 1900, 10·5 inches.

Electricians have never been distinguished for modesty; and therefore the martial nature of the following letter from Messrs. Kennedy and Jenkins, the well-known consulting electrical engineers, which was submitted at the last meeting of the Motherwell Town Council, need not cause any surprise. It seems not to have excited comment in the Council. The Gas Company had complained in January of damage to their pipes through street explosions, caused by electricity; and in reply to this the writers say:—

We have no knowledge of any explosion having occurred in Motherwell from any other cause than gas. During the laying of the mains, Mr. Burbidge constantly reported to us the presence of gas in the ground; and considerable trouble arose on this account in connection with the arc lamp-posts. Mr. Burbidge reports to us that he believes no cables were laid within 3 inches of any pipe, and generally they were at least 6 inches away. The insulation used on the cables is jute, and not bitumen; and the insulation will not, therefore, cause explosive gases to be given off. In only a very few cases was a trough containing bitumen used to protect the cable where the ground had been made up with slag or ash. Mr. Burbidge

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informs us that the ground in Motherwell was constantly sinking, and that the leakage in the gas-pipes was probably caused by this. He gathered that the loss by leakage in the gas-mains is exceptionally large in Motherwell. The cables are laid in a manner approved by the Board of Trade; and the Gas Company have nothing whatever to justify their statement that electrolysis must occur. Referring to clause 14 of the Provisional Order, due notice was sent to the Gas Company before the mains were laid; and as they were entitled to superintend the laying of the mains to protect their pipes, they have no right now to state that the mains have been laid in such a manner as to injure their pipes. Their suggestion as to damage by electrolysis can be entirely disregarded, as the system is earthed at the station in a manner approved by the Board of Trade (being elsewhere completely insulated), and complies in other respects with their regulations. We do not know the rights under which the Gas Company have laid their mains; but note in clause 14 of the Provisional Order a significant reference to pipes "lawfully placed." This is a matter that you will no doubt explain to the Committee, if it affects the present question. Explosions have occurred in certain places on account of bitumen becoming overheated and giving off explosive gas; but as this is only used in a few places in Motherwell, there should be no difficulty in differentiating between an explosion which may possibly be caused by the bitumen and those caused by gas from the gas-mains.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 27.

Sulphate of Ammonia.

There has been a very good demand throughout the week, resulting in a sharp advance at all points. The closing quotations are £11 17s. 6d. per ton f.o.b. Hull, and £11 18s. 9d. to £12 per ton f.o.b. Liverpool and Leith. There has been a good direct demand; and speculators who have had shorts to cover have been driven to paying extreme prices for prompt and near delivery. There has also been a considerable amount of buying for April delivery, for which at the close makers are asking prompt prices; but in this position buyers are not so urgent. In the forward position, there has been a large demand; and up to £11 10s. has been paid for May-October, f.o.b. Leith.

Nitrate of Soda.

This is selling freely at 10s. 6d. per cwt., on spot. The Continent is a shade easier; but in all probability this arises through speculative manipulation.

LONDON, *March* 29.

Tar Products.

There is very little business to report. Pitch continues in very strong demand for both prompt and forward delivery. There is rather an improved inquiry for South Wales; but only for delivery over the present year, whereas makers as a rule seem anxious to sell up to the end of June, 1903. There is, however, a considerable difference between prompt and forward prices, for which the present low freights may to a great extent account. Benzol continues very dull. Some quantity of 90 per cent. has been sold at 8¾d. f.o.b. London; while even a lower price was accepted at outports for prompt shipment. 50-90 per cent. was offered at 8d.; but consumers declined to pay more than 7¾d. prompt, and even at this figure would take only a limited quantity. Crude carbolic is scarcely so firm. A large business has been done in 60's at 1s. 11d. and 1s. 11¼d., March-April; but consumers will not pay these prices forward, evidently believing in lower values ruling. Crystals are decidedly dull, especially 39-40's; and there is only a limited demand for 34-35's. There is absolutely nothing doing in solvent, toluol, or anthracene. These articles have ceased to be of any interest, at least for the present.

Average values during the week are: Tar, 15s. to 19s. 6d. Pitch, London, 41s. to 41s. 6d.; east coast, 39s. to 40s.; west coast, 36s. to 37s. Benzol, 90's, 8¼d. to 9d.; 50-90's, 7¾d. to 7⅞d. Toluol, 9d. Crude naphtha, 3¼d. to 3½d.; solvent naphtha, 10d. to 11d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅜d. to 1½d.; North, ⅞d. to 1d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 11d. to 1s. 11¼d. Naphthalene, 40s. to 50s.; salts, 20s. to 30s. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is very firm indeed, with a strong inquiry for April delivery. The Gaslight and Coke Company have sold almost all they can spare for April, and are now quoting £12 for this month. Up to recently, they were sellers at £11 12s. 6d. May-June; but at present they have withdrawn from the market, not caring to offer anything until after the holidays. A very large business appears to have been transacted at Leith at prices varying from £11 17s. 6d. to £12 April delivery. In Hull, business has been done at £11 12s. 6d. to £11 13s. 9d. in the early part of the week; and later on £11 17s. 6d. is reported to have been paid for fine makes. As regards Liverpool, there is a strong demand for prompt shipment; and prices are firmer. It is difficult to fix the exact value, as very high prices have undoubtedly been paid for sundry parcels for prompt shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

During the past week, there has been the usual interruption of ordinary business operations in the coal trade of this district by the three or four days' stoppage of the pits for the Easter holidays, which has also temporarily strengthened the position of collieries by restricting the output. Generally, however, the position is one of gradual weakening; and there is a good deal of talk of possible lower prices before the close of the present month. So far as Lancashire collieries are concerned, they have mostly cleared out all stocks; and it will only be the pressure of surplus supplies from other districts that can at all bring about any easing in prices just at present. So far as house-fire qualities are concerned, there is in most cases a disposition to hold on to current rates till the end of May; and, except for outside competition, there would be no reason why Lancashire collieries should not be able

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to maintain this position. Their present quotations are firm at 15s. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s to 13s. 6d. for Pemberton four feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. With regard to the lower qualities of round coal, the demand for steam and forge purposes continues fairly g od; and as there is no great surplus on the market, prices have been very steadily held to, at about 8s. 6d. to 9s. at the pit. Inquiries for gas coals are now coming forward; and it is generally admitted that this year's contracts will have to be accepted at even under the prices taken last year. To what extent prices will have to be reduced is, however, at present doubtful. So far as quotations have been made, they are only slightly below 1901 rates; and among Lancashire colliery owners, the outside limit of any concession they are at present likely to entertain would represent a reduction of 6d. to 1s. per ton on last year's maximum prices. It is as yet too early to form any definite opinion as to what the course of prices will ultimately be; but this indicates the general view of the situation among colliery proprietors at present. The better qualities of engine fuel continue in fairly active request, and Lancashire collieries have no difficulty in maintaining prices at about 6s. to 7s. per ton. The commoner sorts, however, are plentiful on the market, and consumers are able to buy at easier rates, owing to the competition from outside districts, Derbyshire especially. Common Lancashire slack can be bought from 4s. 6d. to 5s. per ton, with Derbyshire slack offering from 2s. 6d. to 3s. 6d. at the pit. Shipping business is only indifferent, with ordinary steam coal 10s. to 10s. 6d. delivered at the Mersey ports.

Northern Coal Trade.

There has been a little better demand for coal during the past few days, due to the anticipation of the holidays. In the steam coal trade, however, the working is not full yet; nor is it likely to be so until the Baltic is open. The price that is quoted for best Northumbrian coal for prompt delivery is about 11s. per ton f.o.b., second-class coal is about 10s., and steam smalls are 4s. 9d. to 5s. 3d. Gas coals vary in position. There is now a distinct falling off in the local demand, and in that for most of the home markets; while the inquiry is low for export as yet. The best gas coal collieries seem to have full work and to maintain their prices; but other pits are not quite so well placed. For occasional cargoes, the quotation is from 8s. 3d. to 9s. 3d. per ton f.o.b., according to quality. As to contracts, it may be said that nothing is known to have been concluded as to the South Metropolitan Company; but there are rumours that portions have been allotted to other coalfields than Durham, and that the price under these is 8s. 1½d. Nothing, however, is known with certainty up to the time of writing. Coke is, on the whole, rather firmer. Best Durham coke for export is 17s. per ton f.o.b., blast-furnace coke is about 15s. to 15s. 3d. per ton, free at the Teesside furnaces, and gas coke—now a little less abundant in supply—is unaltered in price locally.

Scotch Coal Trade.

There has been another drop in prices, which is ominous on the eve of the opening of the Baltic season, when the competition of Russian orders might have been expected to keep prices up. The home trade is fairly busy, which is, at all times, the only compensation for the lack of foreign orders. The prices quoted are: Main 8s. 6d. to 8s. 9d. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s. 3d., and splint 9s. 9d. to 10s. The shipments for the week amounted to 159,487 tons—a decrease of 5409 tons as compared with the preceding week, but an increase of 5078 tons as compared with the corresponding week of last year. For the year to date, the total shipments have been 1,969,283 tons—an increase of 205,606 tons upon the same period of last year.

Shirebrook and District Gas Company.—The third annual general meeting of this Company was held at Nottingham, on Monday, the 24th ult.—Mr. R. Frank Vallance presiding. The Directors reported that the building and equipment of the works and plant was proceeding rapidly, and gas was being supplied to customers. The Directors had every confidence in the future of the undertaking. The report was adopted.

St. Anne's-on-the-Sea Gas Company.—At the recent annual meeting of this Company, the profit for the year was stated to be £1914, which, with the balance brought forward, made a surplus of £2035. Dividends were declared of 10 and 7 per cent. on the preference shares and 10 and 5 per cent. on the ordinary shares. The consumption of gas for the year (38¾ million cubic feet) was an increase of 6 millions on the previous year. The report was adopted.

Gas v. Electricity in Newcastle.—At a meeting of the City and Lighting Committee of the Newcastle Corporation last Tuesday, it was decided to put in incandescent gas-lamps, amounting to 66 altogether, in Percy Street and Newgate Street. They will burn 10 cubic feet per lamp per hour, which, in the aggregate, will give a light of nearly 7000-candle power. Several members suggested that the electric light should be introduced in these streets; but, on a vote being taken, it was decided by a large majority to adopt the gas-burners.

Long Eaton Gas Company.—At the recent annual general meeting of this Company, the Directors announced an increase of 13 per cent. in the sale of gas last year compared with 1900—the prepayment meter sales showing a specially large advance. A considerable number of consumers, both ordinary and prepayment, were added, and more cookers were sent out on hire. The Directors are fixing gas-engines upon easy terms, and are engaged, in conjunction with the Secretary and Manager (Mr. G. Stevenson), upon a scheme for installing penny-in-the-slot meters. The old Company have been wound up, and re-constituted under the provisions of the Act obtained last session, the terms of which the Directors consider satisfactory. The accounts presented at the meeting, therefore, were those of the old concern. They showed a sum of £4003 available for distribution; and dividends of 6s. per share on the "A" shares and 5s. per share on the "B" shares (making, with the interim payments, 12s. 6d. and 9s. 6d. per share), with a bonus of 3s. 6d. on each, were recommended, as well as the placing of £300 to a reserve fund, and the carrying forward of the balance. The report was adopted.

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SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. **SMETHWICK, 500,000 Cub. Ft.** **PERNAMBUCO (Brazil), 125,000 Cub. Ft.**
MALTON, 150,000 Cub. Ft. **GRAVESEND, 300,000 Cub. Ft.** **DULUTH, MINN. (2nd Cont.) 300,000 Cub. Ft.**

Birkdale Gas Question.—At a special meeting of the Birkdale District Council last Friday week, a copy of the correspondence between the Southport Corporation and the Local Government Board, on the subject of the reduction in the illuminating power of the gas, was read, and it was resolved that the Birkdale Council could not see their way to accept a lower illuminating power than 16 candles, and that the Clerk inform the Local Government Board and the Southport Corporation accordingly.

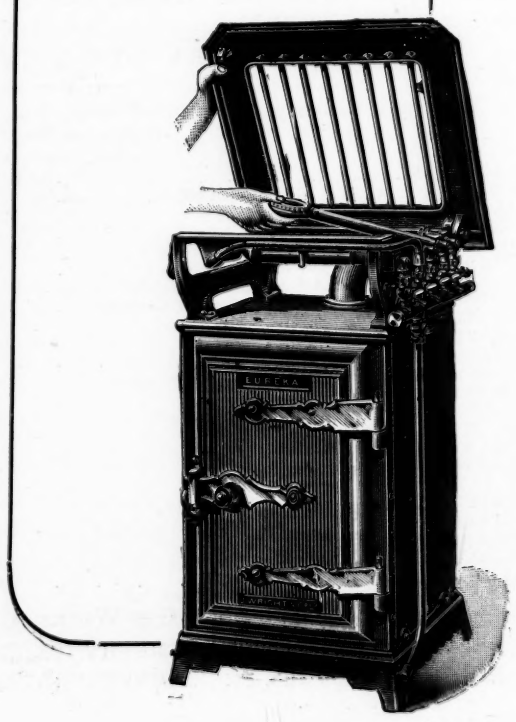
Engineering Tools, Valves, &c.—Owing to the steadily increasing business which they are doing in engineering tools and machinery, the Fairbanks Company have found it necessary to remove to extensive premises at 78 80, City Road, E.C.; and there they are showing and stocking their numerous specialities, among which there are several which are of constant use in gas and water engineering. Formerly the firm bore a good reputation more particularly in connection with their weighing-machines; and the excellent name which they have earned for themselves in that particular line, they are intending to cultivate in other branches of engineering work. We can do little more than simply name (owing to their number) some of the Company's machine tools, the adoption of which would undoubtedly be found of great advantage in the workshops attached to gas and water works. There is, for example, the Merrell pipe threading and cutting machine, which can be had for hand work, power work, or both combined. In one of the American awards which this machine has gained, it is stated that they "are characterized by their efficiency in cutting many sizes of pipe with one set of chasers, and by the convenient means of readily changing the chasers to different sizes. In adjusting, the chasers can be quickly opened and positively closed." Lewis' patent vices, of various kinds and sizes and for various purposes, will tempt the engineer. Our attention has been specially drawn to a quick-acting type, which is made with an interrupted thread like the breech block of a gun. These are extremely simple in construction. A turn of the lever to the left frees the screw, when the jaws can instantly be opened or closed full length at will. The screw will engage at any point; and only one quarter turn of the lever is required to secure work, or to open the jaws. They are positive in action; and as powerful and tenacious as any screw vice. The Company have a good series of what they call their "scientific" portable forges, blowers, exhaust fans, &c.; and a line which is highly recommended are the patent hot-forged increase twist and constant angle twist drills, which, from an inspection, we should say are perfectly accurate and very durable. Of plumbing specialities the Company have many. The valves and joints supplied by them are also numerous, and possess qualifications of a high order, to go into which would require considerable space. Readers will get full information about them by writing to the Company for their illustrated catalogues.

The New Kinver Gas Company has been registered with a capital of £2000, in £1 shares, to acquire the business of gas manufacturer and coal, coke, and lime merchant, carried on by G. Elwell at the Kinver Gas-Works, Kinver, Staffordshire, with the plant and other effects appertaining thereto, and the piece of land now used as a works site, and held for 99 years from March, 1861; and to carry on the above-named business.

At the eleventh annual meeting, last Wednesday, of the Institute of Secretaries, of which Mr. A. H. Cane, Secretary of the Reading Gas Company, is President, it was stated by him that 174 members were elected last year, bringing the number up to 1400; and 63 more had since joined. With regard to the financial stability of the Institute, the income was 20 per cent. in excess of the expenditure. Application has been made for a Royal Charter of Incorporation.

Messrs. Joseph Taylor and Co., of Bolton, have received orders from the Blackpool Corporation Gas Department for a 1½-inch solid plate lead saturator, with 2-inch bottom, of their most recent make, with double detachable ammonia-pipes, the walls of which are 1 inch in thickness; also detachable acid arrangement, lead lips on front and sides, for timber lagging, and drainer mouth, and to be erected complete on foundation. A second tender is for an improved draining-table, lined with 16 lbs. per foot chemical lead, the seams to be lead-burned both inside and out.

Our readers will see, by an announcement which appears elsewhere, that Messrs. Garrod, Turner, and Son, of Ipswich, will offer for sale by auction, on the 10th inst., £3000 of new "C" stock of the Ipswich Gas Company. The interest paid on this stock for the past seven years has been 9 per cent. per annum; and the present issue will carry interest from to-day, free of income-tax. It is intended to reduce the price of gas 2d. per 1000 cubic feet on the 1st of July, which will allow of an additional ½ per cent. dividend being paid. At the last meeting of the Company, a sum of £7641 was carried forward; and they have a reserve fund of £10,985 invested in Colonial Government securities, and an insurance fund of £4125.

The annual profit-sharing distribution among the Warrington employees of the Richmond Gas Stove and Meter Company, Limited, took place at the Warrington works on Monday evening last week. Prior to making the distribution, Mr. E. W. T. Richmond addressed a few words to the men. He said the Company had an increasing business, but had had to meet the conditions which had reduced prices. The result had been that the profit on the Stove Department of the business had gone down considerably. Fortunately, the other branches of the business had done remarkably well, and, in consequence, the Company had been able to pay 10 per cent. On an equitable working of the profit-sharing scheme, no bonus had really been earned by the Stove Department last year; but the Directors had not foreseen that this differential profit might arise. They felt that the principle of profit-sharing was far too important to be jeopardized by any question of this kind; and therefore, although it would cost £2000, they would keep to their word. With regard to the present year, they could already see a very large business opening up, and they were determined, as far as they could, to reduce their expenses and make a larger profit. They intended to deal fairly and generously with all the employees, and he was sure they would, in return, do all they could for them. The distribution to the Warrington employees amounted to £811.

As the
DAYS grow LONGER
Gas Bills
grow
SHORTER
The REMEDY,
in one word, is
"COOKERS"
When you come to Cookers
it will pay you
to go in for the
"EUREKA"